EQB docket No. 02-33-PRP-HUC

BEFORE THE MINNESOTA ENVIRONMENTAL QUALITY BOARD

APPLICATION

OF

HUTCHINSON UTLILITIES COMMISSION

FOR PIPELINE ROUTING PERMIT AND FOR PARTIAL EXEMPTION

FROM PIPELINE ROUTE SELECTION PROCEDURES

PURSUANT

TO MINNESOTA RULES, CHAPTER 4415

TO PERMIT

APPROXIMATELY 89 MILES OF NEW

12 AND 16 INCH NATURAL GAS PIPELINE

IN MARTIN, WATONWAN, BROWN, NICOLLET,

SIBLEY AND MCLEOD COUNTIES

SUBMITTED

MARCH 2002

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4415.0115 GENERAL INFORMATION

Subpart 4. Background Information

A. The applicant's complete name, address and telephone number:

Hutchinson Utilities Commission
225 Michigan Street
Hutchinson, MN 55350
Attn: John Webster

Phone: 320-587-4746

B. The complete name, title, address and telephone number of the official or agent to be contacted concerning the applicant's filing:

Mr. John Webster
Manager – Natural Gas Division
225 Michigan Street
Hutchinson, MN 55350

Phone: 320-587-4746

C. The signature and title of the person authorized to sign the application is:

_____
John Webster, Natural Gas Division Manager

D. A brief description of the proposed project:

(1) General location:

Hutchinson Utilities Commission (HUC) proposes to construct a natural gas pipeline from an inter-connection with Northern Border Pipeline Company (NBPL) near Trimont, MN to HUC facilities at Hutchinson, MN. Approximately 34 miles of the pipeline from Trimont to south of New Ulm will consist of 16-inch outside diameter pipe, and the remaining

55 miles of the pipeline from south of New Ulm to Hutchinson will consist of 12.75-inch outside diameter pipe.

(2) Planned use and purpose:

The proposed pipeline will provide natural gas service to HUC for distribution as heating fuel and to provide fuel for electrical generation. It is anticipated that the city of New Ulm, MN will also utilize the pipeline for natural gas service to the city. It is anticipated that New Ulm will connect to the proposed pipeline near milepost 45.8 and install approximately 4.5 miles of 6.625-inch outside diameter pipe to connect to their existing system.

(3) Estimated costs:

The proposed project is estimated to cost $26,500,000.

(4) Planned in-service date:

October 1, 2003

(5) General design and operational specifications of the type of pipeline which and application is submitted:

The proposed pipeline will be 12.75-inch and 16-inch outside diameter, and will be constructed of welded steel, fusion bonded epoxy coated pipe. The proposed Maximum Allowable Operating Pressure (MAOP) for the new pipeline facility will be 1480 psig.

4415.0120 DESCRIPTION OF PROPOSED PIPELINE AND ASSOCIATED FACILITIES

Subpart 1. Pipeline Design Specifications.

The specifications for pipeline design and construction are assumed to be in compliance with all applicable state and federal rules or regulations unless determined otherwise by the state or federal agency having jurisdiction over the enforcement of such rules or regulations. For public information purposes, the anticipated pipeline design specifications must include but are not limited to:

The United States Department of Transportation Safety Regulations, Title 49 Code of Federal Regulations (CFR) Part 192, prescribes minimum federal safety standards for construction, operation and maintenance of natural gas pipelines. HUC will comply with safety standards for construction, operation and maintenance of natural gas pipelines. HUC will comply with 49 CFR Part 192 in constructing, operating and maintaining the proposed line. Pipeline safety matters for this facility are under the jurisdiction of the Minnesota Office of Pipeline Safety ("OPS").

A. Pipe Size (outside diameter) in Inches:

12.75 and 16

B. Pipe Type:

API 5L, PSL-2, ERW

American Petroleum Institute (API) is a published specification for high-test line pipe. This specification covers various grades of seamless and welded steel line pipe. Process of manufacture, chemical and physical requirements, methods of test, dimensions and other parameters are specified.

Grade designates pipe manufactured according to API specification 5L with specified minimum yield strength (SMYS) designated in pounds per square inch. ERW has one longitudinal seam, which is

formed by electric resistance welding during the manufacturing process

C. Nominal Wall Thickness in Inches:

Outside Diameter (in.)	Wall Thickness (in.)
12.750	.330
16.00	.375

D. Pipe Design Factor:

0.50

E. Longitudinal or Seam Joint Factor:

1.0

F. Class Location and Requirements, Where Applicable:

Class 3

Class location determines which design factor safety value is used in the design formula. The following design factor safety value used for natural gas steel pipeline are based on requirements of 49 CFR 192.111:

Class Location	Design Factor (F)
1	0.72
2	0.60
3	0.50
4	0.40

HUC will design the entire length of the proposed pipeline for a Class 3 location, which will use a design factor of 0.50.

Class location unit is an area that extends 220 yards on either side of the centerline of any continuous one-mile length of pipeline, unless otherwise noted.

A class 1 location is any class location unit that has ten or less buildings intend for human occupancy.

A class 2 location is any class location unit that has more than ten, but less than 46 buildings intended for human occupancy.

A class 3 location is any class location unit that has 46 or more buildings intended for human occupancy; or an area where pipeline lies within 100 yards of either a building or small, well-defined outside area (such as playground, recreation area, outdoor theater, or other place of public assembly) that is occupied by twenty or more persons on at least five days a week for ten weeks in any twelve-month period. (The days and weeks need not be consecutive).

A class 4 location is any class location unit where buildings with four or more stories above ground are prevalent.

G. Specified minimum yield strength in pounds per square inch:

Outside Diameter (in.)	Specified Minimum Yield Strength
12.750	56,000
16.00	65,000

H. Tensile strength in pounds per square inch:

Outside Diameter (In.)	Tensile Strength
12.750	71,000
16	77,000

Subpart 2. Operating Pressure. Operating pressure must include:

A. Operating Pressure - Pounds per Square Inch Gauge (psig) and,

B. Maximum Allowable Operating Pressure (psig).

The maximum actual operating pressure of the proposed pipeline will be approximately 1,300 psig

at the start of the line and is dependent on Northern Border Pipeline Company (NBPL) and the volume throughput of the HUC pipeline.

The maximum allowable operating pressure design point will be 1480 psig. The design pressure for steel pipe is determined in accordance with the following formula (DOT 192.105).

P=(2St/D)xExFxT where,

P=Design pressure in pounds per square inch gauge.

S=Yield strength in pounds per square inch

D=Nominal outside diameter of pipe in inches

t=Nominal wall thickness of the pipe in inches.

F=Design factor.

E=Longitudinal joint factor.

T=Temperature derating factor.

Subpart 3. Description Associated Facilities.

For public information purposes, the applicant shall provide a general description of all pertinent associated facilities on the right-of-way.

There will be three (3) below grade block valves with above ground by-pass arrangements along the line to comply with 49 CFR 192.179, Transmission Line Valves. Near New Ulm, MN there will be a side valve facility to provide service to the city. There will also be launcher and receiver facilities located at approximately the 34 milepost. Launcher and receiver facilities are valve and piping arrangements that allow the introduction and retrieval of internal mechanical or electronic devices to clean or monitor the condition of the inside of the pipeline. The only other associated facilities on the right of way except markers required by the DOT will be

cathodic protection facilities. These will consist of a rectifier and ground bed. There will be approximately three (3) of these facilities whose number and location will be determined by actual measurement of pipe to soil

potentials along the route after the pipeline is installed.

Subpart 4. Product Capacity Information.

The applicant shall provide information on planned minimum and maximum design capacity or throughput in the appropriate unit of measure for the types of product shipped as defined in part 4415.0010.

The proposed pipeline and associated facilities are designed to have a maximum throughput capacity of 40,000 MCF per day. The minimum throughput design is 1,250 MCF per day.

Subpart 5. Product Description.

The proposed pipeline will carry natural gas for use or distribution by HUC and the city of New Ulm, MN.

Subpart 6. Material Safety Data Sheet.

A Material Safety Data Sheet (MSDS) for natural gas is included at the end of the section as Schedule 4415.0120 Subpart 6.

Product Name:	Processed Natural Gas
Product Code:	None

1. CHEMCIAL PRODUCT AND COMPANY IDENTIFICATION

Product Name:	Processed Natural Gas
Product Code:	None
Synonyms:	Dry Gas
Generic Name:	Natural Gas
Chemical Family:	Paraffin hydrocarbon

Responsible Party: Unocal Corporation
Union Oil Company of California
14141 Southwest Freeway
Sugar Land, Texas
77478

For further information contact MSDS Coordinator
8am – 4pm Central Time, Mon – Fri: 337-295-6198

EMERGENCY OVERVIEW

24 Hour Emergency Telephone Numbers:

For Chemical Emergencies:	For Health Emergencies:
Spill, Leak, Fire or Accident	California Poison
Call CHEMTREC	Control System

North America: (800) 424-9300 Cont. US: (800) 356-3129
Others: (703) 527-3887 (collect) Outside US:(415) 821-5338

Health Hazards: use with adequate ventilation

Physical Hazards: Flammable gas. Can cause flash fire. Gas displaces oxygen available for breathing. Keep away from heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment). Do not enter storage areas or confined space unless adequately ventilated.

Physical Form:	Gas
Appearance:	Colorless
Odor:	Odorless in the absence of H2S or mercaptans

NFPA HAZARD CLASS:	Health:	1 (slight)
	Flammability:	4 (extreme)
	Reactivity:	0 (least)

Product Name:	Processed Natural Gas
Product Code:	None

2. COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	% Weight	EXPOSURE GUIDELINES Limits	Agency	Type
Methane CAS# 74-82-8	98	1000 ppm	MSHA	TWA
Carbon Dioxide CAS# 124-38-9	0-5	5000 ppm	ACGIH	TWA
		30000 ppm	ACGIH	STEL
		5000 ppm	OSHA	TWA
		5000 ppm	MSHA	TWA
		5000 ppm	Cal. OSHA	TWA
		30000 ppm	Cal. OSHA	STEL
Nitrogen CAS# 7727-37-9	0-5	1000 ppm	MSHA	TWA
Ethane CAS# 74-84-0	1	1000 ppm	MSHA	TWA

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

3. HAZARDS IDENTIFICATION

POTENTIAL HEALTH EFFECTS:

Eye: Not expected to be an eye irritant.

Skin: Skin contact is unlikely. Skin absorption is unlikely.

Inhalation (Breathing): Asphyxiant. High concentrations in confined spaces may limit oxygen available for breathing.

Ingestion (Swallowing): This material is a gas under normal atmospheric conditions and ingestion is unlikely.

Product Name:	Processed Natural Gas
Product Code:	None

Signs and Symptoms: Light hydrocarbon gases are simple asphyxiants which, at high enough concentrations, can reduce the amount of oxygen available for breathing. Symptoms of overexposure can include shortness of breath, drowsiness, headaches, decreased coordination, visual disturbances and vomiting, and are reversible if exposure is stopped. Continued exposure can lead to hypoxia (inadequate oxygen), cyanosis (bluish discoloration of the skin), numbness of the extremities, unconsciousness and death. High concentrations of carbon dioxide can increase heart rate and blood pressure.

Cancer: No data available.

Target Organs: No data available.

Developmental: Limited data – see other comments, below.

Other Comments: High concentrations may reduce the amount of oxygen available for breathing, especially in confined spaces. Hypoxia (inadequate oxygen) during pregnancy may have adverse effects on the developing fetus. Exposure during pregnancy to high concentrations of carbon monoxide or carbon dioxide, which are produced during the combustion of hydrocarbon gases, can also cause harm to the developing fetus.

Pre-Existing Medical Conditions: None known.

4. FIRST AID MEASURES

Eye: If irritation or redness develops, move victim away from exposure and into fresh air. Flush eyes with clean water. If symptoms persist, seek medical attention.

Skin: First aid is not normally required. However, it is good practice to wash any chemical from the skin.

Inhalation (Breathing): If respiratory symptoms develop, move victim away from source of exposure and into fresh air. If symptoms persist, seek medical attention. If victim is not breathing, immediately begin artificial respiration. If breathing difficulties

Product Name:	Processed Natural Gas
Product Code:	None

develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): This material is a gas under normal atmospheric conditions and ingestion in unlikely.

5. FIRE FIGHTING MEASURES

Flammable Properties:

Flash Point, not applicable (gas)
OSHA Flammability Class: Flammable gas
LEL / UEL: No data
Autoignition Temperature: 800-1000 °F

Unusual Fire & Explosion Hazards: This material is flammable and can be ignited by heat, sparks, flames or other sources of ignition (e.g., static electricity, pilot lights, or mechanical/electrical equipment). Vapors may travel considerable distances to a source of ignition where they can ignite, flashback, or explode. May create vapor/air explosion hazard indoors, outdoors or in sewers. If container is not properly cooled, it can rupture in the heat of a fire. Closed containers exposed to extreme heat can rupture due to pressure buildup.

Extinguishing Media: Dry chemical or carbon dioxide is recommended. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.

Fire Fighting Instructions: For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by DOT, a self-contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8). Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. If this cannot be done, allow fire to burn. Move undamaged containers from immediate hazard area if it can be done with minimal risk. Stay away from ends of container. Water spray may be useful in minimizing or dispersing vapors. Cool equipment exposed to fire with water, if it can be done with minimal risk.

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Product Code:	None

6. ACCIDENTIAL RELEASE MEASURES

Flammable. Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof equipment is recommended. Stay upwind and away from spill/release. Notify persons down wind of spill/release, isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Wear appropriate protective equipment including respiratory protection as conditions warrant (see Section 8). Notify fire authorities and appropriate federal, state and local agencies. Water spray may be useful in minimizing or dispersing vapors (see Section 5).

7. HANDLING AND STORAGE

Handling: The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). Do not enter confined spaces such as tanks or its without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits (see Section 2 and 8). Use good personal hygiene practice.

Storage: Keep container (s) tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces and all sources of ignition. Post area “No Smoking or Open Flame”. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container (s) against physical damage. Outdoor or detached storage is preferred.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits (see Section 2), additionally ventilation or exhaust systems may be required. Where explosive mixtures may be present, electrical systems safe for such locations must be used (see appropriate electrical codes).

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Product Code:	None

Personal Protective Equipment (PPE):

Respiratory: Wear a positive pressure air supplied respirator in oxygen deficient environments (oxygen content <19.5%). A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.

Skin: Not required based on the hazards of the material. However, it is considered good practice to wear gloves when handling chemicals.

Eye/Face: While contact with this material is not expected to cause irritation, the use of approved eye protection to safeguard against potential eye contact is considered god practice.

Other Protective Equipment: A source of clean water should be available in the work area for flushing eyes and skin. Impervious clothing should be work as needed. Self-contained respirators should be available for non-routine and emergency situations.

9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm).

Flash Point: Not applicable (gas)
Flammable/Explosive Limits (%): No data
Autoignition Temperature: 800-1000°F
Appearance: Colorless
Physical State: Gas
Odor: Odorless in the absence of H2S or mercaptans
Vapor Pressure (mm Hg): No data
Vapor Density (air=1): <1
Boiling Point: -259°F
Freezing/Melting Point: No data
Solubility in Water: Slight
Specific Gravity: 0.30+ (Air=1)
Percent Volatile: 100 vol%
Evaporation Rate: (nBuAc=1): N/A (gas)

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Product Code:	None

10. STABILITY AND REACTIVITY

Chemical Stability: Stable under normal conditions of storage and handling.

Conditions to Avoid: Avoid all possible sources of ignition (see Section 5 & 7)

Incompatible Materials: Avoid contact with strong oxidizing agents.

Hazardous Decomposition Products: Combustion can yield carbon dioxide and carbon monoxide.

Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

No definitive information available on carcinogenicity, mutagenicity, target organs or developmental toxicity.

12. DISPOSAL CONSIDERATIONS

This material, if discarded as produced, would be a RCRA "characteristic" hazardous waste due to the characteristic (s) of ignitability (D001). If the material is spilled to soil or water, characteristic testing of the contaminated materials is recommended. Further, this material is subject to the land disposal restriction in 40 CFR 268.40 and may require treatment prior to disposal to meet specific standards. Consult state and local regulations to determine whether they are more stringent than the federal requirements.

Container contents should be completely used and containers should be emptied prior to discard. Container rinsate could be considered a RCRA hazardous waste and must be disposed of with care and in full compliance with federal, state and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a drum reconditioner. To assure

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Product Code:	None

proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

13. TRANSPORT INFORMATION

DOT Proper Shipping Name / Technical Name: Hydrocarbon Gas, Liquefied N.O.S. (Methane)
Hazard Class or Division: 2.1
ID#: UN1965

14. REGULATORY INFORMATION

This material contains the following chemicals subject to the reporting requirements of **SARA 313** and 40 CFR 372:

--None--

Warning: This material contains the following chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm, and are subject to the requirements of **California Proposition 65** (CA Health & Safety Code Section 25249.5):

--None Known--

This material has not been identified as a carcinogen by NTP, IARC, or OSHA.

EPA (CERCLA) Reportable Quantity: --None--

15. DOCUMENTARY INFORMATION

Issue Date: 11/29/99
Previous Issue Date: 3/29/99
Product Code: None
Previous Product Code: None

16. DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

The information in this document is believed to be correct as of the date issued. **HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER**

Product Name:	Processed Natural Gas
Product Code:	None

WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THIS INFORMATION, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. This information and product are furnished on the condition that the person receiving them shall make his own determination as to the suitability of the product for his particular purpose and on the condition that he assume the risk of his use thereof.

4415.0125 LAND REQUIREMENTS

For the proposed pipeline, the applicant shall provide the following information:

A. Permanent right-of-way length, average width, and estimated acreage.

The proposed pipeline right of way is approximately 89 miles in length. The proposed pipeline would be placed on a permanent right of way 50 feet in width. Approximately 539 acres of new right of way would be acquired.

B. Temporary right-of-way (workspace) length, estimated width, and estimated acreage.

Along most of the route an additional 25 feet of temporary workspace will be acquired. It is anticipated that this space would not be fully utilized but would give the construction crews approximately 75 feet of right-of-way for workspace if needed. Localized conditions such as roads, railroads and waterbody crossings may require temporary additional workspace to complete the installation. Permission to use temporary workspace will be obtained from landowners adjacent to the permanent right-of-way. Approximately 270 acres of temporary workspace will be acquired.

C. Estimated range of minimum trench or ditch dimensions including bottom width, top width, depth and cubic yards of dirt excavated.

Trenching is typically accomplished using a crawler-mounted, wheeled-type ditch digging machine or backhoe. Typically the ditch will be 74 inches deep to allow sufficient cover as specified by statue. Trench width will be a minimum of 24-inches for the 12-inch outside diameter pipe and 28-inches for the 16-inch outside diameter pipe. Assuming the maximum possible depth this project will result in approximately 228,280 cubic yards of soil to be excavated.

D. Minimum Depth Cover for State and Federal Requirements.

The State of Minnesota requires a minimum depth of cover to be 54 inches in certain areas as detailed in Minnesota Statutes 116I.06, Subdivisions 1,2,3. HUC will provide for a minimum of 54 inches of ground cover for this proposed pipeline unless waived by the landowner, or to accommodate special construction needs. Federal minimum cover requirements range from 18 inches to 48 inches depending on the circumstances encountered. For most of the proposed route we anticipate that requirements will call for at least 54 inches of cover over the pipeline unless a lesser cover can be negotiated with the respective landowner.

E. Rights-of-way sharing or paralleling; type of facility in the right-of-way, and the estimated length, width, acreage of the right-of-way.

The proposed pipeline will not parallel or share any rights-of-way. During the initial routing process segments of the route were modified, where necessary to avoid wetlands and other areas that would impact the environment or present difficult construction problems. Opportunities to share or parallel any existing rights-of-way that would not increase the impact of the project were pursued at this time. No corridor or existing rights-of-way was available.

4415.0130 PROJECT EXPANSION

If the pipeline and associated facilities are designed for expansion in the future, the applicant shall provide a description of how the proposed pipeline and associated facilities may be expanded by looping, by additional compressor and pump stations, or by other available methods.

The proposed gas pipeline is designed to meet the natural gas supply needs of HUC's current and future needs. No plans for expansion have been incorporated into the design.

4415.0135 RIGHT-OF-WAY PREPARTION PROCEDURES AND CONSTRUCTION ACTIVITY SEQUENCE.

Each applicant shall provide a description of the general right-of-way preparation procedures and construction activity sequence anticipated for the proposed pipeline and related facilities.

RIGHT-OF-WAY

The first step in construction of a pipeline is to prepare the Right-of-Way (ROW). The centerline of the pipeline and points of intersection tangents (PI's) will be established by a survey. Staking will be at a maximum of 400-foot intervals. A construction ROW, 50 feet or 75 feet wide would be cleared. Aboveground vegetation and obstacles would only be cleared as necessary to allow safe and efficient use of construction equipment.

Storage areas required for equipment, pipe, and other materials would be acquired through private permission. These usually consist of vacant or commercially available facilities such as lumberyards, warehouses or similar type areas located strategically along the route. The storage areas would encompass approximately 5 acres.

When encountered along a ROW, fences will be adequately braced before any opening to the fence is made (Figure 5). Locking gates or appropriate fencing would be installed when construction in the area has been completed. Any damage to fences, gates and cattle guards will be restored to the original condition or replaced. Access and livestock control would be employed during construction to limit impact to the use of the land.

CLEARING/GRADING

Clearing of the ROW would follow accepted industry practices and sound construction guidelines. In areas where timbering is required, the trees would be cut in uniform lengths and stacked along the ROW based on the Owner's preferences. The profile of stumps left from timbering would be as low as possible. The removal of stumps would be limited to only that necessitated by pipeline installation unless otherwise negotiated with the landowner. Debris created from ROW preparation will be disposed of using approved methods during restoration.

After the construction area has been cleared of obstacles and prior to trenching, the area would be graded as necessary to create a relatively flat work surface for the passage of heavy equipment and vehicles for subsequent construction activities. Minimal grading would be required on most of the ROW where the terrain is flat to gently sloping. In particularly difficult terrain, a nominal 50-foot wide construction ROW may not be sufficient. Grading and cut-and-fill excavation would be performed to minimize effects on natural drainage and slope stability. On steep terrain or in wet areas, where the ROW must be graded at two elevations (i.e., two-toning) or where diversion dams must be built to facilitate construction, the areas would be restored upon completion of construction to resemble original conditions. Excavation and grading would only be undertaken where necessary to increase stability and decrease the gradient of unstable slopes.

TRENCHING

Most trenching would be performed using a bucket-wheel ditching machine. Conventional tracked backhoes would be used where ground conditions are unsuitable for a ditching machine and if a deeper or wider trench is required. Trench dimensions will comply with applicable normal land use and regulatory requirements. In wet marshy areas, draglines and clamshells are used to do the ditching. To insure the pipe is buried at the proper depth, the trench is drained or pumped dry where practicable or concrete coated pipe is used to overcome any buoyant force. Where the pipe crosses highway or road ditches, the trench or boring is excavated deep enough to provide a minimum of 54 inches of cover over the pipe to comply with Minnesota Department of Transportation (MNDOT) requirements. All surfaced road crossings will be bored, and cased only if required by MNDOT or the respective county, so that traffic flow will not be interrupted.

In areas where there is a need to separate top and subsoil, a two-pass trenching process would be used. The first pass would remove topsoil and the second pass would remove subsoil. Soils from each of the excavations would be placed in separate spoil banks. This allows for proper restoration of the soil during the backfilling process. Spoil banks would contain gaps to prevent storm runoff water from backing up or flooding.

STRINGING

The operation of stringing involves the placement of pipe, from a pipe storage facility or from the pipe mill, along the ROW.

Pipe will be loaded onto trucks, transported to the ROW, and unloaded by trucks equipped with booms rigged to handle pipe. The pipe would be strung either prior to or after ditching.

BENDING

After the joints of pipe are strung along the trench and before the sections of pipe are joined together, individual sections of the pipe are bent to allow for uniform fit of the pipeline with the varying contours of the bottom of the trench and to accommodate changes in the route direction. A track-mounted, hydraulic pipe-bending machine is normally used for this purpose when using the size of pipe proposed for this project. The number of degrees of deflection that is allowed in a field bend is limited to1-1/2 degrees per foot per diameter inch. Bends required that are greater than that allowed in the field are factory fabricated.

LINE-UP

Installation of the pipe, following the bending, commences with internally swabbing the pipe, and aligning the bevels for welding. The weld material is deposited after the proper spacing and alignment of the bevels is accomplished. The line up clamps are held until enough of the weld is completed to assure weld integrity.

WELDING

A very important phase of pipeline construction is the welding process. Welding is the joining of the individual sections of pipe to form the pipeline. Welding must be performed by a qualified welder in accordance with welding procedures qualified to meet the code requirements. They must be tested periodically to maintain the rigorous qualifications for certification of pipeline welding.

Every weld will be inspected by radiographic examination to determine the quality of the weld. Radiographic examination is a nondestructive method of inspecting the inner structure of welds to determine if any defects are present. Defects shall be repaired or removed as outlined in API 1104, the code for “Welding of Pipelines and Related Facilities” which is incorporated by reference by 49 CFR 192.

COATING AND LOWERING-IN

After welding, the girth weld and the pipe adjacent to the weld must be protected from corrosion. When the field coating or wrapping of the weld is completed, the pipeline is ready to be lowered into the trench. Special side boom tractors spread out along the pipeline simultaneously, lift the line and move it over the open trench. The welded string of pipe is then lowered into the trench. An electronic holiday detector is used to monitor the coating during this operation to assure the coating is not damaged. The detector has a device that is pulled along the circumference of the pipe and uses electrical voltage to find any voids in the coating.

BACKFILL

After the pipe has been lowered into the ditch, the trench will be backfilled. The operation should be performed in a manner that will prevent damage to the pipe and pipe coating from equipment or from backfill material. Excess backfill material will be bermed over the ditch centerline to permit natural settling. Where the ditching process was used to separate top and subsoil, backfill is also installed by placing the subsoil into the trench prior to placement of the topsoil to maintain the soil segregation.

TESTING

After backfilling, the pipeline would be tested to ensure that the system is capable of withstanding the operating pressure for which it was designed. The pipeline is filled with water and a pressure equal to 1.5 times the design pressure is maintained for a minimum of eight (8) hours. Water availability and terrain conditions would determine test lengths. Test water would be disposed of as per permit requirements.

CLEAN-UP AND RESTORATION

The final phase of pipeline construction would involve clean up and restoration of the ROW. Removal and disposal of construction debris and any surplus materials would be a part of the clean up. Restoration of the ROW surface would involve smoothing by chisel plow or disc harrows or other equipment, and stabilizing when necessary. In non-cropland the ROW would be re-vegetated according to agreement with the landowner or appropriate government agency.

4415.0140 LOCATION OF PREFERRED ROUTE AND DESCRIPTION OF ENVIRONMENT.

Subpart 1 Preferred route location.

The application must identify the preferred route for the proposed pipeline and associated facilities on any of the following documents, which must be submitted with the application:

A. United States Geological Survey topographical maps to the scale off 1:24,000, if available;

B. Minnesota Department of Transportation County Maps: or

C. Aerial photos or other appropriate maps of equal or greater detail in items A and B. The maps; or photos may be reduced for inclusion in the application. One full sized set shall be provided to the board.

County highway maps showing the location of the proposed route are provided in the Maps section of the application.

Subpart 2. Other route locations.

The only route location is the route shown on the maps provided in the Maps section of the application.

Subpart 3. Description of environment.

The applicant must provide a description of the existing environment along the preferred route.

Human Settlement and Population Density

The proposed pipeline will be installed in rural areas of Martin, Watonwan, Brown, Nicollet, Sibley and McLeod counties in south central Minnesota. The proposed pipeline does not cross any incorporated areas. The area along the route is sparsely populated and is used almost exclusively for agricultural purposes. Very few

buildings intended for human occupancy or other structures are within 500 feet of the proposed route.

The route passes within one (1) mile of six incorporated municipalities. They are Trimont, Ormsby, St James, La Salle and New Ulm. The route will terminate at Hutchinson.

The route does not pass through any population centers.

Table 4415.0140 Subp. 3		
Municipality	**Milepost**	**2000 Population**
Trimont	1	754
Ormsby	7.25	98
St. James	17	4,695
La Salle	24	90
New Ulm	44.5	13,594
Hutchinson	89	13,080

There are approximately 250 parcels of property crossed by the route. Except for public road and railroad right-of-way the proposed pipeline passes through all private land for the entire length of the route with one exception. At approximately milepost 86.25 the route crosses the Luce Line state trail. The trial is located on an old railroad right-of-way and will be approximately 100 feet wide at the crossing location.

Five (5) railroads are crossed along the entire route of the pipeline. There are two (2) US highways and seven (7) state highways that will be crossed. All other road crossings will be limited to county and township roads.

The New Ulm municipal airport is located approximately one (1) mile east and the Hutchinson municipal airport is located approximately one (1) mile north of the proposed route.

Railroad, US highway and state highway crossings and their approximate locations are listed on the following page.

Railroads:

Name	Section	Township	Range	County	Milepost
Union Pacific	19	Galena 104N	32W	Martin	3.4
Union Pacific	22	St. James 106N	32W	Watonwan	16.25
Minnesota Eastern	14	Milford 110N	31W	Brown	44.25
Minnesota Central	5	Cornish 112N	30W	Sibley	58.75
Twin Cities Western	34	Collins 115N	30W	McLeod	72.5

State Highways:

Highway Number	Section	Township	Range	County	Milepost
60	22/27	St. James 106N	32W	Watonwan	15.5
4	11/12	St. James 106N	32W	Watonwan	19.0
29	11	Milford 110N	31W	Brown	44.75
19	5/33	Sibley 112N	30W	Sibley	59.2
15	24/19	Hassan Valley 116N	29W	McLeod	81.9
22	17	Hassan Valley 116N	29W	McLeod	83.25
7	33	Hutchinson 117N	29W	McLeod	86.6

Federal Highways:

Highway Number	Section	Township	Range	County	Milepost
14	14/23	Milford 110N	31W	Brown	43.65
212	34	Collins 115N	30W	McLeod	72.5

Land Use

Agricultural cropland accounts for approximately 95 percent of the land that the proposed route would cross. The land use is summarized in the table on the following page. The majority of the cropland is planted in corn or soybeans. There is a small amount of pastureland and some small wooded areas. No industrial sites are located on the proposed route. Farmsteads and Rural Residencies include the adjoining farmyard areas and any livestock holding and feeding areas associated with the farmyard area. Deciduous

Forest may contain coniferous species but it is dominated by deciduous
species. It includes wood lots, shelterbelts, and other planted areas.

According to the National Wetlands Inventory maps and the Minnesota DNR no wetlands are crossed by the proposed route except for the riparian areas at water crossings.

Table – Land Use		
Description	**Miles Crossed**	**Percentage of Route**
Farmsteads and Rural Residencies	1.02	.011
Other Rural Developments	0.17	.002
Cultivated Land	84.09	.945
Grassland	1.73	.019
Deciduous Forest	1.90	.021
Water	0.08	.001
TOTAL	**89**	**100**

Terrain and Geology

The surficial geology along the proposed pipeline route of south-central Minnesota is dominated by the late Wisconsinan-aged Des Moines Lobe (DML) glacial drift. The DML and its Grantsburg sublobe are the last glacial lobes to advance across south-central Minnesota (Wright 1972a, 1972b). The DML reached its terminal position at the City of Des Moines, Iowa, by 13,800 Before Present (B.P.) (Bettis and others, 1996) and the Grantsburg sublobe is typically assumed to have reached its maximum eastern extent across the current St. Croix River valley and into Wisconsin at the same time. This maximum DML advance was followed by a period of rapid wasting interspersed with periods of readvances (surges). The last surge of the DML within northern Iowa created the Algona Moraine at approximately 12,300 B.P (Bettis and others, 1996). The next apparent surging DML margin occurred in west-central Minnesota and created the Big Stone moraine at approximately 11,700 B.P. (Fenton and others, 1983). This means that the DML wasted rapidly between approximately 12,300 and 11,700 B.P., and that the majority of the upland landscape between northern Iowa

and west-central Minnesota dates to this same late Wisconsinan time. During this time of ice wastage between Iowa and west-central Minnesota, ice-marginal
lakes of varying sizes were periodically created on what we now consider to be upland settings.

The upland landscape of south-central Minnesota is mantled with the DML's yellowish to olive-brown, calcareous loam till, which contains abundant shale fragments and locally common igneous rocks. The DML has been divided into distinct physiographic provinces by Wright (1972b). The Blue Earth Till Plain is a relatively featureless plain south of the Minnesota River valley and is characterized by landforms with a weak northwest linearity. North of the Minnesota River, the Olivia Till Plain is very similar to the Blue Earth Till Plain but exhibits landforms with weak to non-existent northwest linearity. Near Hutchinson, the proposed pipeline route crosses into the Owatonna Moraine (Wright, 1972b) of the DML, a region of higher relief and kettle lakes.

Most of the terrain along the route is level to gently sloping. Exceptions are near major rivers or other waterbodys where steeper slopes are encountered. Depth to bedrock varies but is generally in excess of 100 feet.

Elevations along the route gradually decrease from approximately 1250 feet at milepost 1 to approximately 800 feet at the Minnesota River near milepost 46. They then increase gradually until they reach 1080 feet at the end of the project at milepost 89.

The general terrain is conducive to pipeline construction.

Soils

Well to very poorly drained loamy soils formed in yellowish to olive-brown, calcareous loam till, of Des Moines Lobe Origin are dominant. Much of the flat area along the route is artificiality drained to improve agricultural conditions. The table 4415.0140 Soil Types lists the general soil types by milepost and the approximate percentage of each type. Table 4415.0140 Soil Descriptions is a list of the descriptions for the soil types. Most of

the soils along the route are classified as prime farmland by the Soil Conservation Services (SCS).

Water

Twenty (20) waterbodys have been identified along the route crossed by the proposed pipeline. Seventeen (17) of the waterbodys are designated as protected by the Minnesota DNR Division of Waters (DNR) as shown in the table on the following page. The Cottonwood River and the Minnesota River could be considered major waterbodys while the remainder would be intermediate or minor. In addition one (1) county drainage ditch has also been designated as protected by the DNR. The route crosses a number of other drainage ditches and intermittent or ephemeral streams. The route does not cross any wetlands, farm ponds, or lakes.

At the location where the proposed pipeline would cross the Minnesota River near milepost 46 the river has been designated as a State Canoe Route.

Minnesota DNR Protected Waters Table is shown on the following page.

MINNESOTA DNR PROTECTED WATERS						
Name	**Section**	**Township**	**Range**	**County**	**DNR Protected**	**Milepost**
Cedar Creek	30	Galena 104N	32W	Martin	Yes	2.24
S. Fork Watonwan River	20	Long Lake 104N	32W	Watonwan	Yes	9.31
St. James Creek	3	Long Lake 105N	32W	Watonwan	Yes	13.0
Unnamed Creek	34	St. James 105N	32W	Watonwan	Yes	14.4
Butterfield Creek	36	Riverdale 107N	32W	Watonwan	Yes	20.14
North Fork of Watonwan River	16	Riverdale 107N	31W	Watonwan	Yes	23.6
Little Cottonwood River	14	Sigel 109N	31W	Brown	Yes	37.37
Cottonwood River	35	Milford 110N	31W	Brown	Yes	40.6
Unnamed Creek	35	Milford 110N	31W	Brown	Yes	41
Minnesota River	2	Milford 110N	31W	Brown-Nicollet	Yes	45.9
Unnamed	35	W. Newton 111N	31W	Nicollet	Yes	47.6
Unnamed	27	Round 114N	30W	McLeod	Yes	66.85
High Island Creek	22	Round 114N	30W	McLeod	Yes	68.14
Buffalo Creek	27	Collins 115N	30W	McLeod	Yes	73.8
Co. Ditch #33	15	Collins 115N	30W	McLeod	Yes	75.95
McCuen Creek	18	Hassan V. 116N	29W	McLeod	Yes	82.17
South Fork Crow River	17	Hassan V. 116N	29W	McLeod	Yes	84.12

Vegetation and Wildlife

The Land Use designations, located on page 4 of this section, were used to determine the types of vegetation. Farmsteads and Rural Residencies and Other Rural Developments were combined with the Grassland designation to allow for a type of coverage over the total distance of the proposed route. The majority of the cultivated land is planted in corn or soybeans.

Table – Vegetation Types

Description	Miles Crossed	Percentage of Route
Cultivated Land	85.28	.958
Grassland	1.73	.019
Deciduous Forest	1.90	.021
Water	.08	.001
TOTAL	**89**	**100**

The DNR Regional Fisheries office was contacted regarding the species of fish that may occur in the rivers and streams crossed by the proposed pipeline route. Some of the game fish that may occur are sauger, walleye, northern pike, smallmouth bass, crappie and channel and flathead catfish. There are many non-game fish likely to be present including common carp, drum, chubs, fresh water sucker and others. All waters crossed by the proposed pipeline route are classified as warm water. There are no designated trout streams crossed by the route. Wildlife species that could be present along portions of the route, according to the DNR Regional Wildlife office, are white-tailed deer, cottontail rabbits, badgers, squirrels, raccoons, beaver, foxes and small rodents. Game birds that could inhabit areas along the route include pheasant, ruffled grouse, wild turkey and woodcock. Near waterbodys migratory waterfowl could also be present.

The US Fish and Wildlife Service (USFWS) were contacted for information regarding federally threatened and endangered species along the proposed pipeline route. The FWS responded that the proposed pipeline project would not affect any federally listed species.

Cultural Resources

The Minnesota Historical Society was contacted to review the route pursuant to the Minnesota Historic Sites Act and the Minnesota Field Archaeology Act. They recommended that a survey of the area be completed and assigned SHPO Number 2001-3454 to the project. HUC has contracted with an archaeological consultant to perform a literature search and provide consultation with the SHPO. The Phase I archaeological field investigation scope of work will be negotiated between HUC, their representative, and the SHPO.

The HUC archaeological consultant has performed a literature search for listed sites along the route. The route does not cross any listed sites.

Special Areas

The Minnesota DNR reviewed the Natural Heritage database to determine if any rare plant or animal species or other significant natural feature might be impacted by the proposed project. There are three portions of the proposed pipeline route that could impact native prairie natural communities. Sullivant's Milkweed (Asclepias sullivantii), a state-listed threatened species has been associated with all of the remnants, and Eared False Foxglove (Agalinis auriculata), a state-listed endangered species, has been associated with one of the remnants. Each of these prairie remnants occurs within a railroad right-of-way.

In addition there is an Oak Forrest Natural Community located just west of the proposed pipeline in Nicollet County, T111N (West Newton), R31W and the Joseph A. Tauer Prairie Scientific and Natural Area is located approximately a quarter mile east of the proposed pipeline in Brown County, T109N (Sigel), R31W.

Series Soil Descriptions

TABLE 4415.0140
General Soil Types and Percentages of each by Milepost and County

Milepost	Soil Type	Percent
	MARTIN COUNTY	
1	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.126
1	OKOBOJI AND PALMS SOILS PONDED	0.031
1	NICOLLET CLAY LOAM	0.049
1	DELFT CLAY LOAM	0.112
1	CLARION-SWANLAKE COMPLEX 2 TO 6 PERCENT SLOPES	0.073
1	CLARION-ESTHERVILLE COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.129
1	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.189
1	TERRIL LOAM 1 TO 6 PERCENT SLOPES	0.078
1	CANISTEO-GLENCOE CLAY LOAMS	0.088
1	STORDEN-CLARION COMPLEX 12 TO 18 PERCENT SLOPES ERODED	0.125
2	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.069
2	WEBSTER CLAY LOAM	0.334
2	NICOLLET CLAY LOAM	0.159
2	NICOLLET-CRIPPIN COMPLEX	0.183
2	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.027
2	CANISTEO-GLENCOE CLAY LOAMS	0.228
3	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.1
3	WEBSTER CLAY LOAM	0.205
3	NICOLLET CLAY LOAM	0.192
3	COLAND CLAY LOAM OCCASIONALLY FLOODED	0.152
3	CLARION-ESTHERVILLE COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.047
3	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.095
3	CANISTEO-GLENCOE CLAY LOAMS	0.21
4	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.105
4	WEBSTER CLAY LOAM	0.153
4	NICOLLET CLAY LOAM	0.084
4	CLARION-SWANLAKE COMPLEX 2 TO 6 PERCENT SLOPES	0.226
4	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.186
4	CANISTEO-GLENCOE CLAY LOAMS	0.246
5	WEBSTER CLAY LOAM	0.14
5	GLENCOE CLAY LOAM	0.069
5	NICOLLET CLAY LOAM	0.044
5	CANISTEO CLAY LOAM	0.077
5	NICOLLET-CRIPPIN COMPLEX	0.28
5	CLARION-SWANLAKE COMPLEX 2 TO 6 PERCENT SLOPES	0.39
6	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.228
6	WEBSTER CLAY LOAM	0.212
6	GLENCOE CLAY LOAM	0.08
6	CANISTEO-GLENCOE CLAY LOAMS	0.48
	WATONWAN COUNTY	
7	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.218

Milepost	Soil Type	Percent
	MARTIN COUNTY	
7	WEBSTER CLAY LOAM	0.156

TABLE 4415.0140
General Soil Types and Percentages of each by Milepost and County

Milepost	Soil Type	Percent
	WATONWAN COUNTY	
7	NICOLLET CLAY LOAM	0.261
7	CANISTEO-GLENCOE CLAY LOAMS	0.365
8	WEBSTER CLAY LOAM	0.077
8	NICOLLET CLAY LOAM	0.025
8	LINDER LOAM	0.046
8	NICOLLET-CRIPPIN COMPLEX	0.033
8	CANISTEO-GLENCOE CLAY LOAMS	0.819
9	WEBSTER CLAY LOAM	0.137
9	CRIPPIN LOAM	0.02
9	NICOLLET CLAY LOAM	0.475
9	CANISTEO CLAY LOAM	0.163
9	CANISTEO-GLENCOE CLAY LOAMS	0.204
10	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.231
10	WEBSTER CLAY LOAM	0.248
10	NICOLLET CLAY LOAM	0.265
10	COLAND CLAY LOAM OCCASIONALLY FLOODED	0.093
10	HANLON-KALMARVILLE COMPLEX 0 TO 4 PERCENT SLOPES	0.046
10	DICKINSON FINE SANDY LOAM 2 TO 6 PERCENT SLOPES	0.037
10	STORDEN LOAM 20 TO 35 PERCENT SLOPES	0.013
10	STORDEN-CLARION COMPLEX 12 TO 18 PERCENT SLOPES ERODED	0.067
11	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.201
11	WEBSTER CLAY LOAM	0.081
11	GLENCOE CLAY LOAM	0.129
11	NICOLLET CLAY LOAM	0.233
11	OKOBOJI SILTY CLAY LOAM	0.098
11	CANISTEO CLAY LOAM	0.119
11	CANISTEO-GLENCOE CLAY LOAMS	0.14
12	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.238
12	WEBSTER CLAY LOAM	0.319
12	GLENCOE CLAY LOAM	0.035
12	NICOLLET CLAY LOAM	0.036
12	OKOBOJI SILTY CLAY LOAM	0.199
12	CANISTEO CLAY LOAM	0.172
13	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.281
13	WEBSTER CLAY LOAM	0.33
13	GLENCOE CLAY LOAM	0.27
13	NICOLLET CLAY LOAM	0.119
14	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.171

Milepost	Soil Type WATONWAN COUNTY	Percent
14	WEBSTER CLAY LOAM	0.173
14	GLENCOE CLAY LOAM	0.039
14	CRIPPIN LOAM	0.181

TABLE 4415.0140
General Soil Types and Percentages of each by Milepost and County

Milepost	Soil Type WATONWAN COUNTY	Percent
14	COLAND CLAY LOAM OCCASIONALLY FLOODED	0.144
14	CANISTEO CLAY LOAM	0.062
14	CLARION-STORDEN LOAMS 3 TO 6 PERCENT SLOPES ERODED	0.092
14	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.138
15	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.084
15	WEBSTER CLAY LOAM	0.055
15	GLENCOE CLAY LOAM	0.086
15	CRIPPIN LOAM	0.222
15	OKOBOJI SILTY CLAY LOAM	0.011
15	COLAND CLAY LOAM FREQUENTLY FLOODED	0.053
15	MAYER LOAM	0.074
15	DICKMAN SANDY LOAM 2 TO 6 PERCENT SLOPES	0.045
15	DELFT CLAY LOAM	0.024
15	ESTHERVILLE SANDY LOAM 1 TO 6 PERCENT SLOPES	0.045
15	CANISTEO CLAY LOAM	0.233
15	CLARION-STORDEN LOAMS 3 TO 6 PERCENT SLOPES ERODED	0.069
16	UDORTHENTS LOAMY	0.089
16	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.042
16	WEBSTER CLAY LOAM	0.061
16	GLENCOE CLAY LOAM	0.068
16	CRIPPIN LOAM	0.132
16	OKOBOJI SILTY CLAY LOAM	0.4
16	CANISTEO CLAY LOAM	0.116
16	CLARION-STORDEN LOAMS 3 TO 6 PERCENT SLOPES ERODED	0.092
17	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.056
17	WEBSTER CLAY LOAM	0.028
17	GLENCOE CLAY LOAM	0.115
17	CRIPPIN LOAM	0.052
17	NICOLLET CLAY LOAM	0.13
17	CANISTEO CLAY LOAM	0.518
17	CLARION-ESTHERVILLE COMPLEX 2 TO 6 PERCENT SLOPES ERODED	0.102
18	GLENCOE CLAY LOAM	0.077
18	CRIPPIN LOAM	0.133
18	NICOLLET CLAY LOAM	0.078
18	DICKINSON FINE SANDY LOAM 2 TO 6 PERCENT SLOPES	0.047

Milepost	Soil Type	Percent
	WATONWAN COUNTY	
18	DICKMAN SANDY LOAM 2 TO 6 PERCENT SLOPES	0.139
18	CANISTEO CLAY LOAM	0.481
18	CLARION-STORDEN LOAMS 3 TO 6 PERCENT SLOPES ERODED	0.045
19	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.08
19	WEBSTER CLAY LOAM	0.264
19	CRIPPIN LOAM	0.091
19	NICOLLET CLAY LOAM	0.09

TABLE 4415.0140
General Soil Types and Percentages of each by Milepost and County

Milepost	Soil Type	Percent
	WATONWAN COUNTY	
19	DELFT CLAY LOAM	0.078
19	CANISTEO CLAY LOAM	0.299
19	CLARION-STORDEN LOAMS 3 TO 6 PERCENT SLOPES ERODED	0.097
20	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.066
20	WEBSTER CLAY LOAM	0.197
20	GLENCOE CLAY LOAM	0.044
20	CRIPPIN LOAM	0.006
20	GROGAN SILT LOAM 2 TO 6 PERCENT SLOPES	0.043
20	NICOLLET CLAY LOAM	0.158
20	LINDER LOAM	0.148
20	RIDGEPORT SANDY LOAM 1 TO 6 PERCENT SLOPES	0.002
20	GROGAN-LASA VARIANT COMPLEX 2 TO 6 PERCENT SLOPES ERODED	0.047
20	CANISTEO CLAY LOAM	0.159
20	CLARION-ESTHERVILLE COMPLEX 2 TO 6 PERCENT SLOPES ERODED	0.086
20	CLARION-STORDEN LOAMS 3 TO 6 PERCENT SLOPES ERODED	0.045
21	FIELDON LOAM	0.381
21	LITCHFIELD LOAMY FINE SAND	0.252
21	LINDER LOAM	0.043
21	MAYER LOAM	0.048
21	MILLINGTON CLAY LOAM FREQUENTLY FLOODED	0.17
21	RIDGEPORT SANDY LOAM 1 TO 6 PERCENT SLOPES	0.057
21	CLARION-STORDEN LOAMS 3 TO 6 PERCENT SLOPES ERODED	0.049
22	GROGAN SILT LOAM 2 TO 6 PERCENT SLOPES	0.017
22	FIELDON LOAM	0.165
22	LITCHFIELD LOAMY FINE SAND	0.034
22	LEMOND LOAM	0.275
22	MILLINGTON CLAY LOAM	0.055
22	FIELDON-CANISTEO COMPLEX	0.454
23	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.191
23	NICOLLET CLAY LOAM	0.053
23	LITCHFIELD LOAMY FINE SAND	0.039
23	LEMOND LOAM	0.2

Milepost	Soil Type WATONWAN COUNTY	Percent
23	MILLINGTON CLAY LOAM	0.171
23	DARFUR FINE SANDY LOAM	0.03
23	DICKMAN SANDY LOAM 0 TO 2 PERCENT SLOPES	0.058
23	HOOPESTON FINE SANDY LOAM	0.062
23	SHANDEP CLAY LOAM	0.032
23	GROGAN-DICKINSON COMPLEX 1 TO 4 PERCENT SLOPES	0.09
23	FIELDON-CANISTEO COMPLEX	0.075
24	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.148
24	COLAND CLAY LOAM OCCASIONALLY FLOODED	0.045
24	COLAND CLAY LOAM FREQUENTLY FLOODED	0.095

TABLE 4415.0140
General Soil Types and Percentages of each by Milepost and County

Milepost	Soil Type WATONWAN COUNTY	Percent
24	LINDER LOAM	0.036
24	DICKMAN SANDY LOAM 0 TO 2 PERCENT SLOPES	0.054
24	DICKMAN SANDY LOAM 2 TO 6 PERCENT SLOPES	0.075
24	DELFT CLAY LOAM	0.154
24	BISCAY LOAM	0.087
24	SHANDEP CLAY LOAM	0.12
24	CLARION-ESTHERVILLE COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.04
24	CLARION-STORDEN LOAMS 3 TO 6 PERCENT SLOPES ERODED	0.001
24	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.075
24	FIELDON-CANISTEO COMPLEX	0.07
25	UDORTHENTS LOAMY	0.165
25	FIELDON LOAM	0.135
25	LEMOND LOAM	0.136
25	LINDER LOAM	0.053
25	DICKINSON FINE SANDY LOAM 0 TO 2 PERCENT SLOPES	0.115
25	DARFUR FINE SANDY LOAM	0.136
25	ESTHERVILLE SANDY LOAM 1 TO 6 PERCENT SLOPES	0.259
26	WEBSTER CLAY LOAM	0.105
26	GROGAN SILT LOAM 2 TO 6 PERCENT SLOPES	0.138
26	SPICER SILTY CLAY LOAM	0.044
26	LEMOND LOAM	0.175
26	DICKINSON FINE SANDY LOAM 0 TO 2 PERCENT SLOPES	0.018
26	DICKINSON FINE SANDY LOAM 2 TO 6 PERCENT SLOPES	0.155
26	CORWITH SILT LOAM	0.009
26	GROGAN-DICKINSON COMPLEX 1 TO 4 PERCENT SLOPES	0.144
26	CLARION-SWANLAKE COMPLEX 2 TO 6 PERCENT SLOPES	0.012
26	CLARION-STORDEN LOAMS 3 TO 6 PERCENT SLOPES ERODED	0.114
26	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.086

Milepost	Soil Type WATONWAN COUNTY BROWN COUNTY	Percent
27	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.232
27	WEBSTER CLAY LOAM	0.044
27	NICOLLET CLAY LOAM	0.072
27	MAYER LOAM	0.26
27	DICKMAN SANDY LOAM 2 TO 6 PERCENT SLOPES	0.026
27	DELFT CLAY LOAM	0.076
27	CLARION-SWANLAKE COMPLEX 2 TO 6 PERCENT SLOPES	0.041
27	CLARION-STORDEN LOAMS 3 TO 6 PERCENT SLOPES ERODED	0.229
27	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.018
28	PITS GRAVEL	0.035
28	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.059
28	WEBSTER CLAY LOAM	0.064

TABLE 4415.0140
General Soil Types and Percentages of each by Milepost and County

Milepost	Soil Type BROWN COUNTY	Percent
28	DICKMAN SANDY LOAM MODERATELY WET	0.014
28	LINDER LOAM	0.182
28	DICKMAN SANDY LOAM 0 TO 2 PERCENT SLOPES	0.078
28	DICKMAN SANDY LOAM 2 TO 6 PERCENT SLOPES	0.301
28	DELFT CLAY LOAM	0.097
28	BISCAY LOAM	0.056
28	SPARTA LOAMY SAND 1 TO 6 PERCENT SLOPES	0.054
28	SPARTA LOAMY SAND 6 TO 15 PERCENT SLOPES	0.002
28	CLARION-ESTHERVILLE-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES	0.043
28	CLARION-STORDEN LOAMS 6 TO 12 PERCENT SLOPES ERODED	0.014
29	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.294
29	WEBSTER CLAY LOAM	0.135
29	NICOLLET CLAY LOAM	0.191
29	DARFUR FINE SANDY LOAM	0.047
29	CANISTEO CLAY LOAM	0.144
29	CLARION-STORDEN COMPLEX 2 TO 6 PERCENT SLOPES	0.034
29	CLARION-STORDEN LOAMS 6 TO 12 PERCENT SLOPES ERODED	0.13
29	HANSKA-WEBSTER COMPLEX	0.026
30	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.106
30	GLENCOE CLAY LOAM	0.04
30	OKOBOJI SILTY CLAY LOAM	0.025
30	OKOBOJI MUCK	0.075
30	SEAFORTH LOAM	0.025
30	CANISTEO CLAY LOAM	0.448
30	FIELDON-CANISTEO COMPLEX	0.281
31	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.005

Milepost	Soil Type BROWN COUNTY	Percent
31	OKOBOJI AND PALMS SOILS PONDED	0.036
31	WEBSTER CLAY LOAM	0.029
31	GLENCOE CLAY LOAM	0.181
31	NICOLLET CLAY LOAM	0.144
31	CANISTEO CLAY LOAM	0.528
31	CLARION-STORDEN COMPLEX 2 TO 6 PERCENT SLOPES	0.078
32	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.112
32	WEBSTER CLAY LOAM	0.354
32	NICOLLET CLAY LOAM	0.229
32	OKOBOJI SILTY CLAY LOAM	0.028
32	OKOBOJI MUCK	0.148
32	CANISTEO CLAY LOAM	0.065
32	CLARION-STORDEN COMPLEX 2 TO 6 PERCENT SLOPES	0.063
33	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.025
33	WEBSTER CLAY LOAM	0.121
33	GLENCOE CLAY LOAM	0.093

TABLE 4415.0140
General Soil Types and Percentages of each by Milepost and County

Milepost	Soil Type BROWN COUNTY	Percent
33	NICOLLET CLAY LOAM	0.047
33	OKOBOJI SILTY CLAY LOAM	0.243
33	OKOBOJI MUCK	0.169
33	CANISTEO CLAY LOAM	0.302
34	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.044
34	NICOLLET CLAY LOAM	0.26
34	DICKMAN SANDY LOAM MODERATELY WET	0.068
34	LEMOND LOAM	0.09
34	DICKMAN SANDY LOAM 0 TO 2 PERCENT SLOPES	0.087
34	BLUE EARTH MUCKY SILT LOAM	0.04
34	DICKMAN-CLARION COMPLEX 2 TO 6 PERCENT SLOPES	0.072
34	CANISTEO CLAY LOAM	0.22
34	CANISTEO-MAYER COMPLEX	0.065
34	CLARION-STORDEN COMPLEX 2 TO 6 PERCENT SLOPES	0.053
35	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.084
35	NICOLLET CLAY LOAM	0.091
35	DICKMAN SANDY LOAM MODERATELY WET	0.318
35	LEMOND LOAM	0.106
35	DICKMAN SANDY LOAM 2 TO 6 PERCENT SLOPES	0.14
35	DICKMAN-CLARION COMPLEX 2 TO 6 PERCENT SLOPES	0.106
35	CANISTEO CLAY LOAM	0.05
35	CANISTEO-MAYER COMPLEX	0.106
36	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.031

Milepost	Soil Type BROWN COUNTY	Percent
36	NICOLLET CLAY LOAM	0.072
36	DICKMAN SANDY LOAM MODERATELY WET	0.16
36	DICKMAN SANDY LOAM 2 TO 6 PERCENT SLOPES	0.134
36	HANSKA LOAM DEPRESSIONAL	0.177
36	CANISTEO-MAYER COMPLEX	0.383
36	DICKMAN-NICOLLET COMPLEX	0.031
36	STORDEN-CLARION LOAMS 12 TO 18 PERCENT SLOPES ERODED	0.012
37	WEBSTER CLAY LOAM	0.149
37	NICOLLET CLAY LOAM	0.235
37	DICKMAN SANDY LOAM MODERATELY WET	0.264
37	HANSKA SANDY LOAM	0.05
37	DICKMAN SANDY LOAM 2 TO 6 PERCENT SLOPES	0.06
37	CANISTEO CLAY LOAM	0.131
37	CANISTEO-MAYER COMPLEX	0.028
37	DICKMAN-NICOLLET COMPLEX	0.084
38	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.085
38	WEBSTER CLAY LOAM	0.14
38	NICOLLET CLAY LOAM	0.216

TABLE 4415.0140
General Soil Types and Percentages of each by Milepost and County

Milepost	Soil Type BROWN COUNTY	Percent
38	COLAND CLAY LOAM OCCASIONALLY FLOODED	0.175
38	HANSKA SANDY LOAM	0.05
38	STORDEN LOAM 18 TO 24 PERCENT SLOPES	0.03
38	DICKMAN SANDY LOAM 0 TO 2 PERCENT SLOPES	0.079
38	DICKMAN SANDY LOAM 2 TO 6 PERCENT SLOPES	0.203
38	SPARTA LOAMY SAND 1 TO 6 PERCENT SLOPES	0.024
39	OKOBOJI AND PALMS SOILS PONDED	0.023
39	HANSKA LOAM GRAVELLY SUBSTRATUM	0.026
39	DICKMAN SANDY LOAM MODERATELY WET	0.178
39	LEMOND LOAM	0.177
39	HANSKA SANDY LOAM	0.148
39	DICKMAN SANDY LOAM 0 TO 2 PERCENT SLOPES	0.265
39	DICKMAN SANDY LOAM 2 TO 6 PERCENT SLOPES	0.056
39	DICKMAN-NICOLLET COMPLEX	0.127
40	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.292
40	NICOLLET CLAY LOAM	0.072
40	OKOBOJI SILTY CLAY LOAM	0.033
40	HANSKA LOAM GRAVELLY SUBSTRATUM	0.015
40	DICKMAN SANDY LOAM MODERATELY WET	0.083
40	LEMOND LOAM	0.097
40	KLOSSNER MUCK	0.223

Milepost	Soil Type BROWN COUNTY	Percent
38	COLAND CLAY LOAM OCCASIONALLY FLOODED	0.175
40	DICKMAN-CLARION COMPLEX 2 TO 6 PERCENT SLOPES	0.136
40	CLARION-STORDEN LOAMS 6 TO 12 PERCENT SLOPES ERODED	0.049
41	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.009
41	STORDEN-RIDGEPORT VARIANT LOAMS 15 TO 50 PERCENT SLOPES	0.012
41	DICKINSON FINE SANDY LOAM 0 TO 2 PERCENT SLOPES	0.162
41	HANSKA SANDY LOAM	0.025
41	OSHAWA SILTY CLAY LOAM	0.022
41	DICKMAN SANDY LOAM 0 TO 2 PERCENT SLOPES	0.179
41	DICKMAN SANDY LOAM 2 TO 6 PERCENT SLOPES	0.132
41	ESTHERVILLE SANDY LOAM 0 TO 2 PERCENT SLOPES	0.038
41	MINNEISKA SANDY LOAM	0.038
41	ZUMBRO LOAMY SAND	0.104
41	HANLON SANDY LOAM	0.229
41	RIDGEPORT SANDY LOAM	0.035
41	WATER	0.016
42	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.363
42	WEBSTER CLAY LOAM	0.119
42	NICOLLET CLAY LOAM	0.104
42	LEMOND LOAM	0.113
42	OSHAWA SILTY CLAY LOAM	0.035
42	STORDEN LOAM 20 TO 35 PERCENT SLOPES	0.085

TABLE 4415.0140
General Soil Types and Percentages of each by Milepost and County

Milepost	Soil Type BROWN COUNTY	Percent
42	HANLON SANDY LOAM	0.116
42	TERRIL LOAM 1 TO 6 PERCENT SLOPES	0.028
42	TERRIL LOAM 6 TO 12 PERCENT SLOPES	0.038
43	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.315
43	WEBSTER CLAY LOAM	0.329
43	NICOLLET CLAY LOAM	0.168
43	OKOBOJI SILTY CLAY LOAM	0.053
43	DICKMAN-NICOLLET COMPLEX	0.135
44	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.071
44	WEBSTER CLAY LOAM	0.393
44	NICOLLET CLAY LOAM	0.502
44	OKOBOJI SILTY CLAY LOAM	0.033
45	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.112
45	WEBSTER CLAY LOAM	0.602
45	NICOLLET CLAY LOAM	0.14
45	OKOBOJI SILTY CLAY LOAM	0.146

Milepost	Soil Type	Percent
	BROWN COUNTY	
42	HANLON SANDY LOAM	0.116
	NICOLLET COUNTY	
46	WEBSTER CLAY LOAM	0.325
46	NICOLLET CLAY LOAM	0.426
46	COLAND CLAY LOAM OCCASIONALLY FLOODED	0.005
46	CLARION-TERRIL LOAMS 25 TO 50 PERCENT SLOPES	0.053
46	TERRIL LOAM 1 TO 6 PERCENT SLOPES	0.144
46	TERRIL LOAM 6 TO 12 PERCENT SLOPES	0.047
47	COLAND CLAY LOAM OCCASIONALLY FLOODED	0.018
47	NISHNA SILTY CLAY PONDED	0.05
47	MILLINGTON CLAY LOAM	0.16
47	DU PAGE LOAM	0.062
47	NISHNA SILTY CLAY LOAM	0.592
47	TERRIL LOAM 1 TO 6 PERCENT SLOPES	0.055
47	STORDEN-CLARION COMPLEX 18 TO 50 PERCENT SLOPES	0.026
47	WATER	0.037
48	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.134
48	LESTER LOAM 2 TO 6 PERCENT SLOPES	0.131
48	NICOLLET CLAY LOAM	0.073
48	DELFT CLAY LOAM	0.14
48	CANISTEO CLAY LOAM	0.02
48	CLARION-ESTHERVILLE COMPLEX 2 TO 6 PERCENT SLOPES	0.108
48	CLARION-ESTHERVILLE COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.045
48	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.13
48	LESTER-STORDEN COMPLEX 18 TO 70 PERCENT SLOPES	0.127
48	STORDEN-CLARION COMPLEX 12 TO 18 PERCENT SLOPES ERODED	0.061

TABLE 4415.0140
General Soil Types and Percentages of each by Milepost and County

Milepost	Soil Type	Percent
	NICOLLET COUNTY	
48	STORDEN-CLARION COMPLEX 18 TO 50 PERCENT SLOPES	0.031
49	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.143
49	HARPS CLAY LOAM	0.167
49	CRIPPIN LOAM	0.147
49	NICOLLET CLAY LOAM	0.031
49	DICKINSON FINE SANDY LOAM 2 TO 6 PERCENT SLOPES	0.038
49	DELFT CLAY LOAM	0.206
49	KLOSSNER MUCK	0.029
49	CANISTEO CLAY LOAM	0.077
49	CLARION-STORDEN COMPLEX 2 TO 6 PERCENT SLOPES	0.12
49	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.041
50	HARPS CLAY LOAM	0.199

Milepost	Soil Type	Percent
	NICOLLET COUNTY	
50	GLENCOE CLAY LOAM	0.103
50	DELFT CLAY LOAM	0.055
50	KLOSSNER MUCK	0.288
50	CLARION-STORDEN COMPLEX 2 TO 6 PERCENT SLOPES	0.121
50	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.216
50	STORDEN-CLARION COMPLEX 12 TO 18 PERCENT SLOPES ERODED	0.018
51	HARPS CLAY LOAM	0.223
51	CRIPPIN LOAM	0.013
51	NICOLLET CLAY LOAM	0.03
51	OKOBOJI SILTY CLAY LOAM	0.119
51	DELFT CLAY LOAM	0.231
51	KLOSSNER MUCK	0.178
51	CLARION-ESTHERVILLE COMPLEX 2 TO 6 PERCENT SLOPES	0.049
51	CLARION-STORDEN COMPLEX 2 TO 6 PERCENT SLOPES	0.037
51	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.045
51	STORDEN-CLARION COMPLEX 12 TO 18 PERCENT SLOPES ERODED	0.077
52	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.101
52	WEBSTER CLAY LOAM	0.139
52	GLENCOE CLAY LOAM	0.08
52	NICOLLET CLAY LOAM	0.073
52	DELFT CLAY LOAM	0.218
52	CLARION-ESTHERVILLE COMPLEX 2 TO 6 PERCENT SLOPES	0.063
52	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.235
52	CANISTEO-GLENCOE CLAY LOAMS	0.091
	SIBLEY COUNTY	
53	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.059
53	HARPS CLAY LOAM	0.056
53	WEBSTER CLAY LOAM	0.064
53	NICOLLET CLAY LOAM	0.053

TABLE 4415.0140
General Soil Types and Percentages of each by Milepost and County

Milepost	Soil Type	Percent
	SIBLEY COUNTY	
53	OKOBOJI MUCK	0.286
53	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.01
53	CANISTEO-GLENCOE CLAY LOAMS	0.472
54	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.171
54	HARPS CLAY LOAM	0.057
54	WEBSTER CLAY LOAM	0.008
54	GLENCOE CLAY LOAM	0.095
54	NICOLLET CLAY LOAM	0.059
54	KLOSSNER MUCK	0.167

Milepost	Soil Type	Percent
	SIBLEY COUNTY	
54	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.061
54	CANISTEO-GLENCOE CLAY LOAMS	0.381
55	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.077
55	WEBSTER CLAY LOAM	0.09
55	GLENCOE CLAY LOAM	0.047
55	CRIPPIN LOAM	0.033
55	NICOLLET CLAY LOAM	0.117
55	CANISTEO CLAY LOAM	0.06
55	CANISTEO-GLENCOE CLAY LOAMS	0.575
56	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.014
56	WEBSTER CLAY LOAM	0.105
56	CRIPPIN LOAM	0.071
56	NICOLLET CLAY LOAM	0.083
56	OKOBOJI SILTY CLAY LOAM	0.153
56	CANISTEO CLAY LOAM	0.115
56	CANISTEO-MAYER COMPLEX	0.029
56	CANISTEO-GLENCOE CLAY LOAMS	0.431
57	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.059
57	HARPS CLAY LOAM	0.029
57	WEBSTER CLAY LOAM	0.113
57	GLENCOE CLAY LOAM	0.071
57	OKOBOJI SILTY CLAY LOAM	0.222
57	CANISTEO CLAY LOAM	0.298
57	CLARION-ESTHERVILLE COMPLEX 2 TO 6 PERCENT SLOPES	0.112
57	CANISTEO-GLENCOE CLAY LOAMS	0.096
58	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.273
58	WEBSTER CLAY LOAM	0.023
58	NICOLLET CLAY LOAM	0.141
58	OKOBOJI MUCK	0.073
58	MUSKEGO MUCK	0.104
58	CANISTEO CLAY LOAM	0.143
58	CLARION-ESTHERVILLE COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.086
58	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.034

TABLE 4415.0140
General Soil Types and Percentages of each by Milepost and County

Milepost	Soil Type	Percent
	SIBLEY COUNTY	
58	CANISTEO-GLENCOE CLAY LOAMS	0.123
59	WEBSTER CLAY LOAM	0.153
59	GLENCOE CLAY LOAM	0.001
59	NICOLLET CLAY LOAM	0.028
59	CANISTEO CLAY LOAM	0.089
59	CANISTEO-GLENCOE CLAY LOAMS	0.729

Milepost	Soil Type	Percent
	SIBLEY COUNTY	
60	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.142
60	HARPS CLAY LOAM	0.074
60	WEBSTER CLAY LOAM	0.357
60	GLENCOE CLAY LOAM	0.017
60	NICOLLET CLAY LOAM	0.057
60	OKOBOJI MUCK	0.157
60	CANISTEO CLAY LOAM	0.067
60	CLARION-ESTHERVILLE COMPLEX 2 TO 6 PERCENT SLOPES	0.129
61	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.325
61	HARPS CLAY LOAM	0.195
61	WEBSTER CLAY LOAM	0.113
61	NICOLLET CLAY LOAM	0.214
61	OKOBOJI SILTY CLAY LOAM	0.071
61	CANISTEO CLAY LOAM	0.039
61	CLARION-ESTHERVILLE COMPLEX 2 TO 6 PERCENT SLOPES	0.042
62	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.209
62	HARPS CLAY LOAM	0.063
62	WEBSTER CLAY LOAM	0.183
62	GLENCOE CLAY LOAM	0.013
62	NICOLLET CLAY LOAM	0.183
62	OKOBOJI SILTY CLAY LOAM	0.073
62	OKOBOJI MUCK	0.079
62	KLOSSNER MUCK	0.018
62	CANISTEO CLAY LOAM	0.008
62	CLARION-ESTHERVILLE COMPLEX 2 TO 6 PERCENT SLOPES	0.172
63	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.284
63	WEBSTER CLAY LOAM	0.136
63	NICOLLET CLAY LOAM	0.181
63	OKOBOJI SILTY CLAY LOAM	0.135
63	CANISTEO CLAY LOAM	0.161
63	CANISTEO-GLENCOE CLAY LOAMS	0.103
64	WEBSTER CLAY LOAM	0.342
64	NICOLLET CLAY LOAM	0.364
64	OKOBOJI SILTY CLAY LOAM	0.041
64	KLOSSNER MUCK	0.101

TABLE 4415.0140
General Soil Types and Percentages of each by Milepost and County

Milepost	Soil Type	Percent
	SIBLEY COUNTY	
64	CANISTEO CLAY LOAM	0.152
65	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.091
65	HARPS CLAY LOAM	0.012
65	WEBSTER CLAY LOAM	0.073

Milepost	Soil Type	Percent
	SIBLEY COUNTY	
64	CANISTEO CLAY LOAM	0.152
65	GLENCOE CLAY LOAM	0.062
65	NICOLLET CLAY LOAM	0.26
	MCLEOD COUNTY	
65	CANISTEO CLAY LOAM	0.344
65	DICKMAN-NICOLLET COMPLEX	0.044
65	CANISTEO-GLENCOE CLAY LOAMS	0.114
66	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.121
66	HARPS CLAY LOAM	0.27
66	WEBSTER CLAY LOAM	0.017
66	GLENCOE CLAY LOAM	0.028
66	NICOLLET CLAY LOAM	0.033
66	OKOBOJI SILTY CLAY LOAM	0.28
66	CANISTEO-GLENCOE CLAY LOAMS	0.251
67	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.178
67	HARPS CLAY LOAM	0.031
67	GLENCOE CLAY LOAM	0.031
67	NICOLLET CLAY LOAM	0.165
67	KLOSSNER MUCK	0.203
67	CANISTEO-GLENCOE CLAY LOAMS	0.391
68	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.307
68	HARPS CLAY LOAM	0.166
68	WEBSTER CLAY LOAM	0.107
68	NICOLLET CLAY LOAM	0.039
68	OKOBOJI SILTY CLAY LOAM	0.015
68	KLOSSNER MUCK	0.182
68	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.045
68	CANISTEO-GLENCOE CLAY LOAMS	0.14
69	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.107
69	HARPS CLAY LOAM	0.051
69	GLENCOE CLAY LOAM	0.202
69	NICOLLET CLAY LOAM	0.061
69	CANISTEO-GLENCOE CLAY LOAMS	0.58
70	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.199
70	HARPS CLAY LOAM	0.024
70	WEBSTER CLAY LOAM	0.148
70	GLENCOE CLAY LOAM	0.023
70	NICOLLET CLAY LOAM	0.043
70	CLARION-SWANLAKE COMPLEX 2 TO 6 PERCENT SLOPES	0.081

TABLE 4415.0140
General Soil Types and Percentages of each by Milepost and County

Milepost	Soil Type	Percent
	MCLEOD COUNTY	

Milepost	Soil Type	Percent
	MCLEOD COUNTY	
70	CLARION-ESTHERVILLE COMPLEX 2 TO 6 PERCENT SLOPES	0.12
70	CANISTEO-GLENCOE CLAY LOAMS	0.361
71	HARPS CLAY LOAM	0.097
71	WEBSTER CLAY LOAM	0.167
71	NICOLLET CLAY LOAM	0.03
71	KLOSSNER MUCK	0.459
71	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.06
71	CANISTEO-GLENCOE CLAY LOAMS	0.186
72	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.163
72	HARPS CLAY LOAM	0.035
72	WEBSTER CLAY LOAM	0.161
72	NICOLLET CLAY LOAM	0.278
72	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.052
72	CANISTEO-GLENCOE CLAY LOAMS	0.309
73	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.361
73	WEBSTER CLAY LOAM	0.036
73	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.036
73	CANISTEO-GLENCOE CLAY LOAMS	0.567
74	HARPS-GLENCOE COMPLEX	0.085
74	WEBSTER CLAY LOAM	0.036
74	NICOLLET CLAY LOAM	0.029
74	COLAND CLAY LOAM OCCASIONALLY FLOODED	0.127
74	COLAND CLAY LOAM FREQUENTLY FLOODED	0.119
74	CLARION-SWANLAKE COMPLEX 2 TO 6 PERCENT SLOPES	0.302
74	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.173
74	CANISTEO-GLENCOE CLAY LOAMS	0.129
75	HARPS-GLENCOE COMPLEX	0.634
75	NICOLLET CLAY LOAM	0.091
75	CLARION-SWANLAKE COMPLEX 2 TO 6 PERCENT SLOPES	0.189
75	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.086
76	HARPS-GLENCOE COMPLEX	0.594
76	NICOLLET CLAY LOAM	0.096
76	CANISTEO CLAY LOAM	0.109
76	CLARION-SWANLAKE COMPLEX 2 TO 6 PERCENT SLOPES	0.202
77	CLARION LOAM 1 TO 4 PERCENT SLOPES	0.154
77	HARPS-GLENCOE COMPLEX	0.155
77	WEBSTER CLAY LOAM	0.136
77	NICOLLET CLAY LOAM	0.114
77	CANISTEO CLAY LOAM	0.089
77	CLARION-SWANLAKE COMPLEX 2 TO 6 PERCENT SLOPES	0.352
78	HARPS-GLENCOE COMPLEX	0.463
78	NICOLLET CLAY LOAM	0.086

TABLE 4415.0140
General Soil Types and Percentages of each by Milepost and County

Milepost	Soil Type MCLEOD COUNTY	Percent
78	CLARION-SWANLAKE COMPLEX 2 TO 6 PERCENT SLOPES	0.451
79	HARPS-GLENCOE COMPLEX	0.271
79	NICOLLET CLAY LOAM	0.158
79	DELFT CLAY LOAM	0.049
79	CLARION-SWANLAKE COMPLEX 2 TO 6 PERCENT SLOPES	0.03
79	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.473
79	STORDEN-CLARION COMPLEX 12 TO 18 PERCENT SLOPES ERODED	0.019
80	HARPS-GLENCOE COMPLEX	0.348
80	CRIPPIN LOAM	0.036
80	CLARION-SWANLAKE COMPLEX 2 TO 6 PERCENT SLOPES	0.457
80	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.053
80	STORDEN-CLARION COMPLEX 12 TO 18 PERCENT SLOPES ERODED	0.106
81	HARPS-GLENCOE COMPLEX	0.559
81	GLENCOE CLAY LOAM	0.037
81	NICOLLET CLAY LOAM	0.097
81	KLOSSNER MUCK	0.246
81	CLARION-SWANLAKE COMPLEX 2 TO 6 PERCENT SLOPES	0.061
82	HARPS-GLENCOE COMPLEX	0.299
82	WEBSTER CLAY LOAM	0.034
82	NICOLLET CLAY LOAM	0.135
82	MAYER LOAM	0.018
82	BLUE EARTH MUCKY SILT LOAM	0.075
82	CLARION-SWANLAKE COMPLEX 2 TO 6 PERCENT SLOPES	0.217
82	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.221
83	WEBSTER CLAY LOAM	0.009
83	MAYER LOAM	0.123
83	BLUE EARTH MUCKY SILT LOAM	0.02
83	WADENA LOAM 2 TO 6 PERCENT SLOPES	0.123
83	CLARION-SWANLAKE COMPLEX 2 TO 6 PERCENT SLOPES	0.223
83	CANISTEO-GLENCOE CLAY LOAMS	0.502
84	LINDER LOAM	0.069
84	MAYER LOAM	0.085
84	MILLINGTON CLAY LOAM	0.061
84	MILLINGTON CLAY LOAM FREQUENTLY FLOODED	0.023
84	CLARION-ESTHERVILLE COMPLEX 2 TO 6 PERCENT SLOPES	0.127
84	CLARION-ESTHERVILLE COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.095
84	CLARION-STORDEN COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.071
84	CANISTEO-GLENCOE CLAY LOAMS	0.469
85	UDORTHENTS LOAMY	0.075
85	COKATO-LE SUEUR COMPLEX 1 TO 6 PERCENT SLOPES	0.034
85	COKATO-STORDEN COMPLEX 2 TO 6 PERCENT SLOPES	0.366
85	MILLINGTON CLAY LOAM FREQUENTLY FLOODED	0.01

TABLE 4415.0140
General Soil Types and Percentages of each

by Milepost and County

Milepost	Soil Type MCLEOD COUNTY	Percent
85	CANISTEO-GLENCOE CLAY LOAMS	0.508
85	STORDEN-CLARION COMPLEX 12 TO 18 PERCENT SLOPES ERODED	0.006
86	KLOSSNER SANDY SUBSTRATUM-HARPS-MAYER COMPLEX	0.054
86	CRIPPIN LOAM	0.319
86	COKATO-STORDEN COMPLEX 2 TO 6 PERCENT SLOPES	0.029
86	COKATO-STORDEN COMPLEX	0.056
86	CANISTEO-GLENCOE CLAY LOAMS	0.542
87	CORDOVA CLAY LOAM	0.202
87	KLOSSNER SANDY SUBSTRATUM-HARPS-MAYER COMPLEX	0.06
87	COKATO-STORDEN COMPLEX 2 TO 6 PERCENT SLOPES	0.17
87	LE SUEUR LOAM	0.162
87	BLUE EARTH MUCKY SILT LOAM	0.03
87	KLOSSNER MUCK	0.112
87	CANISTEO-GLENCOE CLAY LOAMS	0.263
88	CORDOVA CLAY LOAM	0.075
88	COKATO-STORDEN COMPLEX 2 TO 6 PERCENT SLOPES	0.484
88	CLARION-ESTHERVILLE COMPLEX 6 TO 12 PERCENT SLOPES ERODED	0.023
88	CANISTEO-GLENCOE CLAY LOAMS	0.417
89	CORDOVA CLAY LOAM	0.029
89	CRIPPIN LOAM	0.055
89	COKATO LOAM 2 TO 6 PERCENT SLOPES	0.267
89	COKATO-STORDEN COMPLEX 2 TO 6 PERCENT SLOPES	0.169
89	COKATO-STORDEN COMPLEX	0.077
89	CANISTEO-GLENCOE CLAY LOAMS	0.399

County	Approximate Milepost – Enter	Approximate Milepost - Leave
Martin	0	7
Watonwan	7	26.9
Brown	26.9	46
Nicollet	46	52.9
Sibley	52.9	65.5
McLeod	65.5	89

Series Soil Descriptions

BISCAY SERIES

The Biscay series consists of very deep, poorly drained and very poorly drained soils that formed in glacial outwash consisting of a loamy mantle over calcareous sandy or sandy-skeletal sediments. These soils are on outwash plains, till plains, valley trains and stream terraces. They have moderate permeability in the upper part of the profile and rapid or very rapid permeability in the lower part. Slopes range from 0 to 2 percent. The mean annual precipitation is about 28 inches. The mean annual air temperature is about 48 degrees F.

BLUE EARTH SERIES

The Blue Earth series consists of very deep, very poorly drained soils that formed in coprogenous earth in postglacial lakes and flood plains. These soils have moderate or moderately slow permeability. Slopes range from 0 to 1 percent. Mean annual precipitation is about 28 inches. Mean annual temperature is about 48 degrees F.

CANISTEO SERIES

The Canisteo series consists of very deep, poorly and very poorly drained soils that formed in calcareous loamy glacial till or in a mantle of loamy or silty sediments and underlying calcareous loamy glacial till. These soils are on glacial moraines. They have moderate permeability. Slopes range from 0 to 2 percent. Mean annual precipitation is about 28 inches. Mean air annual temperature is about 48 degrees F.

CLARION SERIES

The Clarion series consists of very deep, moderately well drained, moderately permeable soils formed in glacial till on uplands. Slopes range from 1 to 9 percent. Mean annual air temperature is about 47 degrees F. Mean annual precipitation is about 29 inches.

COKATO SERIES

The Cokato series consists of very deep, well drained soils that formed in calcareous, loamy glacial till. They are on convex and linear slopes on moraines. These soils have moderate permeability. Slopes range from 6 to 40 percent. Mean annual precipitation is about 28 inches. Mean annual air temperature is about 47 degrees F.

COLAND SERIES

The Coland series consists of very deep, poorly drained, moderately permeable soils formed in alluvium on floodplains. Slope ranges from 0 to 5 percent. Mean annual air temperature is about 47 degrees F. Mean annual precipitation is about 29 inches.

CORDOVA SERIES

The Cordova series consists of very deep, poorly drained soils that formed mostly in loamy calcareous glacial till on ground moraines and till plains. The upper part of the profile in some of these soils formed in modified glacial till. These soils have moderately slow permeability. Their slopes are less than 2 percent. Mean annual precipitation is about 28 inches. Mean annual temperature is about 48 degrees F.

CORWITH SERIES

The Corwith series consists of deep, somewhat poorly drained, moderately permeable soils that formed in medium-textured sediments. These soils are on uplands, glacial lake plains, and outwash areas. Slopes are convex and range from 1 to 3 percent. Mean annual temperature is about 47 degrees F, and mean annual precipitation is about 28 inches.

CRIPPIN SERIES

The Crippin series consists of calcareous, very deep, somewhat poorly drained, moderately permeable soils formed in glacial till on uplands. Slope ranges from 0 to 3 percent. Mean annual temperature is about 47 degrees F. Mean annual precipitation is about 29 inches.

DARFUR SERIES

The Darfur series consists of very deep, poorly drained soils formed in lacustrine and outwash sediments on glacial lake plains, stream terraces and outwash plains. The permeability is moderate or moderately rapid in the upper mantle and moderately rapid in the subsoil and substratum. Slopes range from 0 to 2 percent. Mean annual air temperature is about 47 degrees F, and mean annual precipitation is 28 inches.

DELFT SERIES

The Delft series consists of very deep, poorly drained and somewhat poorly soils that formed in loamy colluvium derived from till and underlying loamy till on till plains and moraines. These soils have moderate permeability. Slopes range from 1 to 4 percent. Mean annual air temperature is about 48 degrees F. Mean annual precipitation is about 26 inches.

DICKINSON SERIES

The Dickinson series consists of very deep, well-drained soils formed in glacial or alluvial deposits that have been reworked by wind on uplands and stream terraces. Permeability is moderately rapid in the upper part and rapid in the lower part. Slopes range from 0 to 30 percent. Mean annual temperature is about 45 degrees F. Mean annual precipitation is about 29 inches.

DICKMAN SERIES

The Dickman series consists of very deep, somewhat excessively drained soils that formed in glacial outwash or eolian materials consisting of a loamy mantle and underlying sandy sediments. These soils are on outwash plains, valley trains, stream terraces and deltas. They have moderately rapid permeability in the mantle and rapid permeability in the underlying sediments. Slopes range from 0 to 18 percent. Mean annual precipitation is about 28 inches. Mean annual air temperature is about 48 degrees F.

DU PAGE SERIES

The Du Page series consists of very deep, well-drained and moderately well drained soils formed in alluvium on nearly level flood plains. Permeability is moderate. Slopes are 0 to 4 percent. Mean annual precipitation is about 36 inches, and mean annual air temperature is about 50 degrees F.

ESTHERVILLE SERIES

The Estherville series consists of very deep, somewhat excessively drained soils that formed in glacial outwash sediments, which consist of a loamy mantle and underlying sandy and gravelly sediments. They are on outwash plains, stream terraces, valley rains, and kames. They have moderately rapid permeability in the upper part and rapid or very rapid permeability in the underlying sediments. Slopes range from 0 to 70 percent. Mean annual precipitation is about 28 inches. Mean annual temperature is about 46 degrees F.

FIELDON SERIES

The Fieldon series consists of very deep, poorly drained soils that formed in loamy and sandy glacial outwash or deltaic sediments on glacial lake and outwash plains. These soils have moderate and moderately rapid permeability in the upper part and rapid permeability in the lower part. Their slopes range for 0 to 2 percent. Mean annual precipitation is about 28 inches, and mean annual temperature is about 48 degrees F.

GLENCOE SERIES

The Glencoe series consists of very deep, very poorly drained soils that formed in loamy sediments from glacial till on glacial moraines. These soils have moderate or moderately slow permeability. Slopes are 0 to 1 percent. Mean annual precipitation is about 28 inches. Mean annual temperature is about 48 degrees F.

GROGAN SERIES

The Grogan series consists of very deep, moderately well drained soils that formed in stratified, calcareous lacustrine sediments on glacial lake plains. These soils have moderately rapid permeability. Slopes range from 0 to 6 percent. Mean annual precipitation is about 26 inches, and mean annual air temperature is about 48 degrees F.

HANLON SERIES

The Hanlon series consists of very deep, moderately well drained, moderately rapidly permeable soils formed in alluvium on flood plains. Slopes range from 0 to 3 percent. Mean annual air temperature is about 46 degrees F. Mean annual precipitation is about 31 inches.

HANSKA SERIES

The Hanska series consists of deep poorly and very poorly drained soils that formed in loamy and sandy glacial outwash or lacustrine sediments on glacial outwash and lacustrine plains. These soils have moderately rapid permeability in the upper part and rapid permeability in the lower part. Their slopes range from 0 to 2 percent. Mean annual precipitation is about 28 inches, and mean annual temperature is about 48 degrees F.

HARPS SERIES

The Harps series consists of very deep, poorly drained, moderately permeable soils formed in glacial till or alluvium on uplands. Slope ranges from 0 to 3 percent. Mean annual air temperature is about 48 degrees F. Mean annual precipitation is about 30 inches.

HOOPESTON SERIES

The Hoopeston series consists of very deep, somewhat poorly drained soils formed in loamy and sandy sediments on outwash plains, valley trains, and stream terraces. Permeability is moderately rapid. Slope ranges from 0 to 5 percent. Mean annual precipitation is about 35 inches, and mean annual temperature is about 52 degrees F.

KLOSSNER SERIES

The Klossner series consists of very deep, very poorly drained soils formed in well decomposed organic material 16 to 50 inches thick overlying loamy deposits on moraines, till plains, lake plains, flood plains, and hillside seep areas. They have moderately slow to moderately rapid permeability in the organic material, and moderate or moderately slow permeability in the loamy material.

Slopes range from 0 to 8 percent. Mean annual precipitation is about 28 inches. Mean annual temperature is about 47 degrees F.

LE SUEUR SERIES

The Le Sueur series consists of very deep, somewhat poorly drained soils that formed in calcareous loamy glacial till on moraines. These soils have moderate permeability. Their slopes range from 1 to 3 percent. Mean annual precipitation is about 29 in inches. Mean annual air temperature is about 47 degrees F.

LEMOND SERIES

The Lemond series consists of deep poorly drained and very poorly drained soils that formed in loamy and sandy glacial outwash sediments on glacial outwash and lacustrine plains. These soils have moderately rapid permeability in the upper part and rapid permeability in the lower part. Their slopes range from 0 to 2 percent. Mean annual precipitation is about 28 inches, and mean annual temperature is about 48 degrees F.

LESTER SERIES

The Lester series consists of very deep, well-drained soils that formed in calcareous loamy glacial till on till plains and moraines. These soils have moderate permeability. Their slopes range from 5 to 70 percent. Mean annual precipitation is about 2 inches. Mean annual temperature is about 47 degrees F.

LINDER SERIES

The Linder series consists of very deep, somewhat poorly drained soils formed in glacial outwash consisting of a 24 to 40 inch loamy mantle over sandy and gravelly sediments on outwash plains, till plains and stream terraces. Permeability is moderate or moderately rapid in the loamy mantle and very rapid in the substratum. Slopes range from 0 to 2 percent. Mean annual temperature is about 47 degrees F. Mean annual precipitation is about 29 inches.

LITCHFIELD SERIES

The Litchfield series consists of very deep, moderately well drained soils that formed in glaciofluvial deposits on outwash plains, terraces, or deltas. Permeability is moderately rapid or rapid. Slopes range from 0 to 3 percent. Mean annual temperature is 48 degrees F. Mean annual precipitation is 28 inches.

MAYER SERIES

The Mayer series consists of very deep poorly and very poorly drained soils that formed in glacial outwash sediments consisting of a loamy mantle and underlying sandy and gravelly sediments. These soils are on outwash plains, till plains, and stream terraces. Permeability is moderate in the upper part and rapid permeability in the lower part. Slopes range from 0 to 2 percent. Mean annual precipitation is about 27 inches. Mean annual temperature is about 47 degrees F.

MILLINGTON SERIES

The Millington soils consist of very deep, poorly drained, moderately permeable soils formed in alluvium on flood plains. Slope gradients are less than 2 percent. Mean annual air temperature is about 47 degrees F., and mean annual precipitation is about 30 inches.

MINNEISKA SERIES

The Minneiska series consists of very deep, moderately well drained soils that formed in calcareous alluvium on floodplains. These soils have moderately rapid permeability. They have slopes of 0 to 4 percent. Mean annual precipitation is about 30 inches. Mean annual temperature is about 49 degrees F.

MUSKEGO SERIES

The Muskego series consists of very deep, very poorly drained soils formed in herbaceous organic material over coprogenous limnic material (sedimentary peat) on glacial lake plains and flood plains. These soils have moderate or moderately rapid permeability in the herbaceous organic material and slow permeability in the coprogenous material. Slopes range from 0 to 2 percent. Mean annual precipitation is about 30 inches near the typical pedon site. Mean annual temperature is about 49 degrees F.

NICOLLET SERIES

The Nicollet series consists of very deep, moderately well and somewhat poorly drained soils that formed in calcareous loamy glacial till on till plains and glacial moraines. These soils have moderate permeability. Their slopes range from 0 to 5 percent. Mean annual precipitation is about 28 inches. Mean annual temperature is about 48 degrees F.

NISHNA SERIES

The Nishna series consists of very deep, poorly drained and very poorly drained, slowly permeable soils formed in alluvium on flood plains. Slope ranges from 0 to 2 percent. Mean annual air temperature is about 52 degrees F, and mean annual precipitation is about 31 inches.

OKOBOJI SERIES

The Okoboji series consists of very deep, very poorly drained, moderately slowly permeable soils formed in silty alluvium washed from glacial till. They are in depressions on till plains and moraines. Slope ranges from 0 to 1 percent. Mean annual temperature is 48 degrees F. Mean annual precipitation is about 30 inches.

OSHAWA SERIES

The Oshawa series consists of very deep, very poorly drained soils that formed in calcareous alluvium on flood plains. These soils have moderately slow permeability. Slopes are less than 1 percent. Mean annual precipitation is about 28 inches. Mean annual air temperature is about 47 degrees F.

PALMS SERIES

The Palms series consist of very deep, very poorly drained soils formed in well decomposed organic material 16 to 51 inches thick and loamy deposits in closed depressions on moraines, lake plains, outwash plains, hillside seep areas, and in back swamps of floodplains. They have moderately slow to moderately rapid permeability in the organic material and moderate or moderately slow permeability in the loamy material. Slopes range from 0 to 6 percent. Mean annual precipitation is about 30 inches, and mean annual temperature is about 48 degrees F.

RIDGEPORT SERIES

The Ridgeport series consists of somewhat excessively drained soils formed in about 2 to 3 feet of moderately coarse textured alluvium overlying calcareous sand and gravel. Permeability is moderately rapid in the moderately coarse textured material and very rapid in the sand and gravel. They are on stream terraces and have slopes of 0 to 14 percent. Mean annual temperature is about 50 degrees F, and mean annual precipitation is about 29 inches.

SEAFORTH SERIES

The Seaforth series consists of deep, moderately well drained soils that formed in loamy calcareous glacial till on ground moraines and till plains. They have moderate permeability. Slopes range from 1 to 3 percent. Mean annual precipitation is about 4 inches, and mean annual temperature is about 46 degrees F.

SHANDEP SERIES

The Shandep series consists of very poorly drained soils formed in loamy sediments that overlie sand and gravel in depressions on stream terraces and outwash plains. These soils have moderate permeability in the solum and rapid permeability in the underlying sand and gravel. Slopes are 0 to 1 percent. Mean annual temperature is about 49 percent F, and mean annual precipitation is about 32 inches.

SPARTA SERIES

The Sparta series consists of very deep, excessively drained soils formed in sandy outwash on stream terraces, outwash terraces, and outwash plains. Permeability is rapid.

Slopes range from 0 to 40 percent. Mean annual precipitation is about 30 inches. Mean annual temperature is about 49 degrees F.

SPICER SERIES

The Spicer series consists of deep, poorly and very poorly drained soils that formed in silty glacial lacustrine sediments or loess on glacial lake plains and loess-mantled uplands. These soils have moderate permeability. Their slopes range from 0 to 2 percent. Mean annual precipitation is about 27 inches, and mean annual temperature is about 47 percent F.

STORDEN SERIES

The Storden series consists of very deep, well-drained soils that formed in calcareous loamy glacial till on glacial moraines. These soils have moderate permeability. Slopes range from 4 to 70 percent. Mean annual precipitation is about 26 inches. Mean annual air temperature is about 48 degrees F.

TERRIL SERIES

The Terril series consists of very deep, moderately well drained, moderately permeable soils formed in loamy local colluvium/alluvium on foot slopes, alluvial fans, and stream terraces of till plains. Slope ranges from 0 to 25 percent. Mean annual air temperature is about 49 degrees F., and mean annual precipitation is about 30 inches.

WADENA SERIES

The Wadena series consists of well-drained soils that formed in glacial outwash consisting of a 24 to 40 inch loamy mantle over sandy and sandy- skeletal sediments. These soils are on glacial outwash plains, stream terraces, and valley trains. They have moderate permeability in the solum and very rapid permeability in the underlying material. They have slopes of 0 to 18 percent. Mean annual precipitation is about 28 inches. Mean annual temperature is about 48 degrees F.

WEBSTER SERIES

The Webster series consists of very deep, poorly drained, moderately permeable soils formed in glacial till or local alluvium derived from till on uplands. Slope ranges from 0 to 3 percent. Mean annual air temperature is about 48 degrees F, and mean annual precipitation is about 30 inches.

ZUMBRO SERIES

The Zumbro series consists of deep well and moderately well drained soils that formed in sandy postglacial alluvium on high flood plains and low terraces. These soils have rapid permeability. Their slopes range from 0 to 2 percent. Mean annual precipitation is about 30 inches and mean annual temperature is about 47 degrees F.

Table 4415.0140
General Soil Types and Percentage of Each
By Milepost and County

4415.0145 ENVIRONMENTAL IMPACT OF PREFERRED ROUTE

The applicant must also submit to the board along with the application an analysis of the potential human and environmental impacts that may be expected from pipeline right-of-way preparation and construction practices and operation and maintenance procedures. The impacts include but are not limited to the impacts for which criteria are specified in part 4415.0040 or 4415.0100.

An analysis of the impacts from construction of the proposed pipeline indicates they would be temporary. No long-term impacts are anticipated. The pipeline would be installed almost entirely in cultivated cropland that would continue to be used for the same purpose after the project was completed. Specific analyses of the impacts are listed below.

Human Settlement and Population Density

Some short-term socioeconomic effects would occur to the population centers along the route. Approximately half of the anticipated work force (75 workers) would be from outside the local area. Their economic activities (e.g., housing rental, hotels, fuel sales, restaurants, and grocery stores) would add to the economies of some of the population centers along the route. About the same number of local workers would be employed which would increase the amount of local payrolls during the construction period. No significant or long-term demands for local government facilities or services would occur because of the relatively short construction period.

Impacts to existing roads within the project area would be short-term and minimal. Paved roads would be bored as well as any important or heavily traveled gravel roads. This would eliminate most all impact to traffic. No new roads would be constructed. Necessary road crossing permits would be obtained from state or local authorities. Impacts to existing railroads would be very minimal as it is anticipated that the crossings would be accomplished by boring under the railroad right-of-way. Crossing permits would be obtained from the individual railroads.

No compression facilities are to be installed on the proposed pipeline so there would not be any exhaust or other noise from these facilities. The pipeline does not generate any noise under normal operations. During construction the machinery generates noise between 75-90 decibels within 50 feet of the equipment. The noise is typical of the machinery that is used in

tilling, harvesting and other agriculture operations. Equipment noise impact would be short-term as the construction process moves continuously along the right-of-way.

Land Use

Land within the permanent right-of -way and any temporary workspace would be impacted during the construction period. The impact would be short-term, as the construction period normally will last about sixty (60) days at any one location. All land would be restored as nearly as practicable to pre-construction conditions. No land would be removed from agricultural use since the pipeline would be buried well below plow depth and drain tile. The cropland could return to production as soon as construction was completed. Pastureland would be re-seeded and quickly re-vegetated to pre-construction conditions following construction. During construction the agricultural land productivity would be reduced for a short time until the process moved past a particular area. Landowners would be compensated by HUC for any crop damages incurred due to the construction activity. All agriculture uses would be allowed to continue within the new permanent right-of-way.

Construction may impact appurtenant agriculture items such as drainage systems, fences and livestock. When active tile drainage systems are encountered temporary repairs will be made immediately to allow continuation of flow. Permanent repair will be made prior to the start of restoration activities (Figure 3). Where fences or gates are encountered temporary gaps will be installed (Figure 5). All fences and gates will be rebuilt to their prior or new condition (Figure 6). If it is necessary for livestock or farm machinery to cross the open trench, equipment bridges or trench plugs will be strategically located to allow access. Appropriate fencing or other means will be employed to prevent any livestock from falling into areas where there are open trenches.

Terrain and Geology

Little or no impact to the terrain and geology should result from construction, operation or maintenance of the pipeline facilities. No special construction techniques are expected to be necessary because of the terrain or geology. Impacts would be limited to the construction phase. For most of the proposed route the terrain is level to gently rolling with a total elevation change of approximately 450 feet. Little or no

grading is anticipated in order to prepare the surface for the construction equipment over most of the route.

At some steeper areas more extensive grading may be required. Temporary erosion control measures such as jute matting and silt fencing would be utilized to prevent erosion until permanent measures are put in place. Any changes to the natural terrain would be re-graded to establish the natural contours that existed prior to construction. Permanent slope breakers would be installed to divert water off the right-of-way where necessary to prevent damage to the graded areas.

Sand and gravel are likely the primary mineral resource occurring along the proposed pipeline route. No active mining operation would be directly affected by the construction of the pipeline. However, reserves within the permanent right-of-way could not be utilized for the life of the project.

Faults, earthquakes, landslide susceptibility, and ground subsidence in karst terrain are geologic hazards that may pose a risk to the integrity of a pipeline. There are no active faults located across or along the route of the proposed pipeline. Seismic activity in the area has been very limited. Since pipeline damage is usually associated with a large-scale catastrophic seismic event and no such earthquake has been recorded in the project area, the probability of damage to the pipeline due to earthquake is unlikely. Damage to the pipeline due to landslides is also unlikely because the proposed route would be in generally flat terrain. Since the pipeline would be mainly in material not laid down by deposition over karst or rocks prone to dissolution, ground subsidence damage would be unlikely.

Soils

The primary effect of pipeline construction on soils is erosion associated with disturbing the vegetative cover and loss of soil productivity due to soil mixing and/or compaction. Mixing of topsoil with sub-soil could impact productivity of cropland. Soil segregation practices eliminate virtually all mixing of topsoil and subsoil (Figures 1, 2 & 4). Topsoil segregation methods in annually cultivated or rotated agricultural lands will be employed by HUC. Activity on the right-of-way will be curtailed when conditions such as wet weather were conducive to soil compaction. Chisel or other type plowing, and/or other measures, during restoration of the affected area will mitigate soil compaction.

Temporary and permanent erosion control measures will be employed during construction to minimize erosion caused by water and wind. Slope breakers, sediment barriers and mulch would be used to prevent erosion by water. Soil loss by wind
could likely occur when the right-of-way area is very dry after the vegetative cover has been removed. During construction, activity would be limited when there was enough wind to cause erosion. It is typical to control dust during the construction phase with water applied by spray bars mounted on trucks equipped with water tanks. Excessive dust is detrimental to construction activities and is controlled diligently to avoid loss of production and to promote safety. After construction, restoration of the right-of-way in non-cropland areas includes seeding and mulching that help prevent further dust omissions. Impact to soils would be short term.

Water

a. Groundwater

Construction of the proposed pipeline may cause minor impact on groundwater flow in localized areas, but would not affect overall groundwater recharge in the project area. Groundwater is not a major source of drinking water in the area. Shallow aquifers could experience minor impact from changes in overland water flow and recharge caused by clearing and grading of the right-of-way. Construction equipment could also cause compaction of soils crossed by the construction right-of-way, resulting in locally reduced soil infiltration rates. The pipeline trench would generally be approximately 6 feet deep and would only intersect shallow aquifers. In low-lying areas, de-watering of the trench may be required and could temporarily affect groundwater levels in the immediate vicinity of the trench.

Blasting could result in temporary changes in groundwater levels and increased turbidity in groundwater supply wells near the blast site. Due to the depth of bedrock along the proposed route no blasting is anticipated. Any impacts to groundwater would be short term.

Construction of the proposed pipeline would not require the installation or abandonment of any water wells or connection to or changes in any public water supply. The Minnesota Department of Health files for municipal wells, described as the Community Public Water Supply

Source GIS file current as of 8/8/2001, was accessed by the Minnesota Planning Land Management Information Center. There were no wells within a 1000-foot buffer of the proposed pipeline route. The nearest well was approximately 2600 feet away.

Refueling of vehicles, or the transportation and storage of fuel, oil and other hazardous liquids could create a contamination hazard to aquifers. Accidental spills or leaks of hazardous liquids could contaminate soil and groundwater and affect aquifer users. Contaminated soils could continue to leach pollutants to the groundwater for an extended period of time after the spill or leak. HUC would prohibit refueling activities and storage of hazardous liquids within at least a 200-foot radius of all private wells and at least a 400-foot radius of all municipal or community water supply wells. In addition, HUC has developed a Spill Prevention, Containment, and Countermeasure (SPCC) Plan that describes the preventive and mitigative measures that would be implemented to minimize the impact associated with such occurrences. Implementation of HUC's SPCC Plan would avoid or minimize construction related impact on private wells and groundwater supplies.

b. Surface Water

The pipeline would cross the 100-year floodplains of the Minnesota and Cottonwood rivers and numerous other streams. Flooding of major streams and rivers is confined to topographically distinct floodplains and occurs during heavy or extended rainfall events. However, since the proposed pipeline would be underground, there would be no effect on flood storage. No above ground facilities would be sited in a floodplain.

Seventeen (17) waterbodies are designated as protected by the Minnesota DNR Division of Waters (DNR) as shown in the table 4415.0140. Permits to cross these waterbodies will be obtained from the DNR and the crossing methods will be dictated by the permit conditions.

In general, impact on surface waters could occur during pipeline construction activities, such as clearing and grading in areas adjacent to streams, trenching, trench de-watering, backfilling, blasting, and during withdrawal and discharge of hydrostatic test water. The magnitude of potential impact depends on several factors, including

each stream's physical dimensions, stream bottom composition, rate of stream flow, water quality at and downstream of the crossing location, and erosion potential of soil in cleared areas adjacent to the stream. Direct impact on streams could include increased sedimentation at crossing locations and downstream, the release of nutrients from the sediments, and destruction of large and small aquatic animals. Sedimentation and increased turbidity caused by construction could also smother fish eggs and reduce the availability of suitable spawning areas, as well as temporarily affect fish movement and feeding patterns. Receiving water bodies for any surface water runoff are identified in table 4415.0145.

At the location where the proposed pipeline would cross the Minnesota River near milepost 46 the river has been designated as a State Canoe Route. As indicated below this crossing would be made using the directional drill method. The only impact would be visual, if the drilling equipment could be seen from the water level. The impact would be minimal and short term.

HUC proposes to cross the Cottonwood and Minnesota River using the directional drill technique. Any inadvertent releases of drilling fluids would be contained by hay bales or other appropriate materials. Vacuum or sump pumps would then be used to clean up and transfer the drilling fluids back to the entry or exit points of the drilling mud pits for either reprocessing or disposal. If the directional drill cannot be completed, the borehole would be sealed by mixing a commercially available grout additive into the drilling fluid as the drill pipe is withdrawn.

While directional drilling may be used to avoid instream construction, directional drilling is not always technically feasible and unforeseen circumstances could cause the crossing attempt to fail. In the event that a directional drill is infeasible or fails in process, HUC would open-cut these waterbodies. Trenching of the Cottonwood and Minnesota rivers would be by dragline or dredge and would be completed in 48 hours. Staging and spoil areas would be placed in accordance with HUC's procedures in their SPCC Plan.

All streams that would not be directionally drilled would be crossed using the conventional open-cut method. The

primary impact resulting from open-cut construction would occur during instream activities, and would include increased turbidity and sedimentation, and disruption of stream bottom communities in the vicinity of the trenching location. These impacts would be temporary and short term since instream construction would be completed within 24 hours at minor waterbodies (less than 10 feet wide) and within 48 hours at intermediate waterbodies (between 10 and 100 feet wide).

A hydrostatic test of the pipeline is required prior to it being placed in service. HUC will propose to withdraw approximately 2.1 million gallons from the Minnesota River for this purpose. HUC would screen water intakes to prevent entrapment of fish and debris, and would neither withdraw nor discharge water during critical fish spawning periods. No chemicals would be added to the hydrostatic test water. The water would be tested during withdrawal, after the pipeline is filled, and during discharge. Discharge would be back into the Minnesota River or other locations as per permit requirements. The hydrostatic test water will be discharged into a holding tank with a progressive weir arrangement to trap rust, mill scale or other undesirable items. The discharge rate would be regulated and splash plates or other similar devices installed to disperse the discharge in order to prevent erosion, streambed scour, suspension of sediments, or excessive stream flow. Hydrostatic test water appropriation permit would be obtained from the Minnesota DNR and the discharge permit from the Minnesota Pollution Control Agency. Impact would be minimal and short term.

Vegetation and Wildlife

a. Vegetation

Agricultural fields planted predominantly in corn and soybeans are the dominant vegetation types that would be crossed by the proposed pipeline. Agricultural and grasslands would quickly re-vegetate to pre-construction conditions following construction. Clearing of the right-of-way in non-agricultural areas would be limited to the minimum amount required to safely install the proposed pipeline. After construction HUC would only maintain a minimum amount of cleared right-of-way for operations and maintenance purposes. Construction of the proposed pipeline would result in short term impact to

vegetation and not cause any appreciable change in the type of vegetation cover.

b. Wildlife

Construction of the proposed facilities would likely result in temporary and permanent impact on wildlife habitat, as well as
minor, temporary impact on wildlife in the immediate vicinity of the construction areas. Clearing of vegetation would result in reduced cover, nesting and foraging habitat for some wildlife. More mobile species would be temporarily displaced from the construction areas to similar habitats nearby, while less mobile species such as small mammals, reptiles, and amphibians would likely be destroyed during construction. Routine vegetation maintenance, after restoration of the right-of-way, would be minimized and produce much less extensive effects on wildlife. The long-term conversion of a small amount of forested land to a scrub/grassy condition would not significantly change the existing habitat composition or wildlife populations of the area.

In general, pipeline construction at stream crossings would cause short-term increases in turbidity and siltation downstream and alteration or temporary loss of shoreline cover. This could result in temporary relocation of fish and other aquatic species that may occur near and downstream of the construction area.

Special Areas

The Minnesota DNR reviewed the Natural Heritage database to determine if any rare plant or animal species or other significant natural feature might be impacted by the proposed project. There are three portions of the proposed pipeline route, which could impact native prairie natural communities.

Native prairie natural communities could be impacted at three locations. These locations contain state-listed threatened and endangered species. All of the locations are associated and located within a railroad right-of-way. Underground boring methods will be utilized to pass underneath the railroad right-of-way so that construction within the right-of-way is avoided. Disturbed non-cultivated soil adjacent to these areas will be revegetated with native species suitable to the local habitat as soon as possible after construction, to prevent the invasion of unwanted species to invade the area.

An Oak Forest Natural Community is located just to the west of the proposed pipeline in Nicollet County, T111N (West Newton),

R31W, Section 35. If the area cannot be avoided completely HUC will minimize the impact in all ways possible. Disturbance of the area will be limited to only the area necessary for safe installation of the pipeline facilities. Erosion control, revegetation and other methods will be employed to limit any impact to the area.

The Joseph A. Tauer Prairie Scientific and Natural Area is located approximately a quarter mile east of the proposed pipeline in Brown County, T109N (Sigel), R31W. County highway 22 is the primary access to the area and would be bored during installation of the pipeline. This will allow unimpeded access to the area and avoid any impact.

Surface Water Runoff
Immediate Receiving Waters

Mile	Major Watershed Name	Minor Watershed Name	Feet	Percent
1	BLUE_EARTH	CEDAR L	4497	0.85
1	BLUE_EARTH	CREEK TO CEDAR LAKE	784	0.15
2	BLUE_EARTH	CEDAR L	4639	0.88
2	BLUE_EARTH	CEDAR CR	642	0.12
3	BLUE_EARTH	CEDAR CR	4306	0.82
3	BLUE_EARTH	CEDAR L	974	0.18
4	BLUE_EARTH	CEDAR L	5280	1.00
5	BLUE_EARTH	CEDAR L	5280	1.00
6	WATONWAN	CREEK TO WILLOW CREEK	5030	0.95
6	BLUE_EARTH	CEDAR L	250	0.05
7	WATONWAN	CREEK TO WILLOW CREEK	3858	0.73
7	WATONWAN	S FORK WATONWAN R	1422	0.27
8	WATONWAN	CREEK TO WILLOW CREEK	3636	0.69
8	WATONWAN	S FORK WATONWAN R	1644	0.31
9	WATONWAN	S FORK WATONWAN R	5280	1.00
10	WATONWAN	S FORK WATONWAN R	5280	1.00
11	WATONWAN	S FORK WATONWAN R	3881	0.74
11	WATONWAN	ST JAMES CR	1399	0.27
12	WATONWAN	ST JAMES CR	3584	0.68
12	WATONWAN	CO DITCH #1	1696	0.32
13	WATONWAN	ST JAMES CR	4147	0.79
13	WATONWAN	CO DITCH #1	1134	0.22
14	WATONWAN	ST JAMES CR	4915	0.93
14	WATONWAN		320	0.06
14	WATONWAN	CO DITCH #1	46	0.01
15	WATONWAN		4771	0.90

Surface Water Runoff
Immediate Receiving Waters

Mile	Major Watershed Name	Minor Watershed Name	Feet	Percent
15	WATONWAN	ST JAMES CR	509	0.10
16	WATONWAN	ST JAMES CR	5280	1.00
17	WATONWAN	ST JAMES CR	3695	0.70
17	WATONWAN		1585	0.30
18	WATONWAN		5280	1.00
19	WATONWAN		5280	1.00
20	WATONWAN	BUTTERFIELD CR	2748	0.52
20	WATONWAN		2532	0.48
21	WATONWAN	BUTTERFIELD CR	2369	0.45
21	WATONWAN		1558	0.30
21	WATONWAN	BUTTERFIELD CR	1353	0.26
22	WATONWAN	BUTTERFIELD CR	5280	1.00
23	WATONWAN	BUTTERFIELD CR	5280	1.00
24	WATONWAN	WATONWAN R	4432	0.84
24	WATONWAN	BUTTERFIELD CR	848	0.16
25	WATONWAN	WATONWAN R	5280	1.00
26	WATONWAN	JUDICIAL DITCH 13	3732	0.71
26	WATONWAN	WATONWAN R	1548	0.29
27	WATONWAN		2891	0.55
27	WATONWAN	JUDICIAL DITCH 13	1611	0.31
27	WATONWAN	FROM L HANSKA	777	0.15
28	WATONWAN	FROM L HANSKA	5280	1.00
29	MIDDLE_MINNESOTA	JUD DITCH #10	5013	0.95
29	WATONWAN	FROM L HANSKA	267	0.05
30	MIDDLE_MINNESOTA	JUD DITCH #10	5280	1.00
31	MIDDLE_MINNESOTA	JUD DITCH #10	5280	1.00
32	MIDDLE_MINNESOTA	JUD DITCH #10	5280	1.00

Surface Water Runoff
Immediate Receiving Waters

Mile	Major Watershed Name	Minor Watershed Name	Feet	Percent
33	MIDDLE_MINNESOTA	JUD DITCH #10	3621	0.69
33	MIDDLE_MINNESOTA	COUNTY DITCH 68	1659	0.31
34	MIDDLE_MINNESOTA	COUNTY DITCH 68	5280	1.00
35	MIDDLE_MINNESOTA	COUNTY DITCH 68	5280	1.00
36	MIDDLE_MINNESOTA	LITTLE COTTONWOOD R	3060	0.58
36	MIDDLE_MINNESOTA	COUNTY DITCH 68	2220	0.42
37	MIDDLE_MINNESOTA	LITTLE COTTONWOOD R	5280	1.00
38	MIDDLE_MINNESOTA	LITTLE COTTONWOOD R	4771	0.90
38	COTTONWOOD	COTTONWOOD R	510	0.10
39	COTTONWOOD	COTTONWOOD R	4890	0.93
39	MIDDLE_MINNESOTA	LITTLE COTTONWOOD R	390	0.07
40	COTTONWOOD	COTTONWOOD R	5280	1.00
41	COTTONWOOD	COTTONWOOD R	3897	0.74
41	COTTONWOOD	CREEK TO COTTONWOOD R	1383	0.26
42	COTTONWOOD	CREEK TO COTTONWOOD R	5280	1.00
43	COTTONWOOD	CREEK TO COTTONWOOD R	4053	0.77
43	MIDDLE_MINNESOTA	MINNESOTA R	1227	0.23
44	MIDDLE_MINNESOTA	MINNESOTA R	5280	1.00
45	MIDDLE_MINNESOTA	MINNESOTA R	4553	0.86
45	COTTONWOOD	CREEK TO COTTONWOOD RI	727	0.14
46	MIDDLE_MINNESOTA	MINNESOTA R	5280	1.00
47	MIDDLE_MINNESOTA	MINNESOTA R	5280	1.00
48	MIDDLE_MINNESOTA	MINNESOTA R	5280	1.00
49	MIDDLE_MINNESOTA	CREEK TO MINNESOTA R	4210	0.80
49	MIDDLE_MINNESOTA	MINNESOTA R	1070	0.20
50	MIDDLE_MINNESOTA	MINNESOTA R	3321	0.63
50	MIDDLE_MINNESOTA	CREEK TO MINNESOTA R	1960	0.37
51	MIDDLE_MINNESOTA	CREEK TO HUELSKAMP CREEK	5095	0.97

Surface Water Runoff
Immediate Receiving Waters

Mile	Major Watershed Name	Minor Watershed Name	Feet	Percent
51	MIDDLE_MINNESOTA	MINNESOTA R	185	0.04
52	MIDDLE_MINNESOTA	CREEK TO HUELSKAMP CREEK	5280	1.00
53	MIDDLE_MINNESOTA	FRITSCHE CR	2973	0.56
53	MIDDLE_MINNESOTA	CREEK TO HUELSKAMP CREEK	2251	0.43
53	LOWER_MINNESOTA	JUD DITCH #1	57	0.01
54	LOWER_MINNESOTA	JUD DITCH #1	5280	1.00
55	LOWER_MINNESOTA	JUD DITCH #1	5280	1.00
56	LOWER_MINNESOTA	JUD DITCH #1	5280	1.00
57	LOWER_MINNESOTA	CO DITCH #13	4963	0.94
57	LOWER_MINNESOTA	JUD DITCH #1	317	0.06
58	LOWER_MINNESOTA	CO DITCH #13	5280	1.00
59	LOWER_MINNESOTA	CO DITCH #13	4822	0.91
59	LOWER_MINNESOTA	MIDDLE BR RUSH R	458	0.09
60	LOWER_MINNESOTA	MIDDLE BR RUSH R	3876	0.73
60	LOWER_MINNESOTA	COUNTY DITCH 44	1404	0.27
61	LOWER_MINNESOTA	COUNTY DITCH 44	5280	1.00
62	LOWER_MINNESOTA	COUNTY DITCH 44	5280	1.00
63	LOWER_MINNESOTA	COUNTY DITCH 44	5280	1.00
64	LOWER_MINNESOTA	JUDICIAL DITCH 18	3573	0.68
64	LOWER_MINNESOTA	COUNTY DITCH 44	1707	0.32
65	LOWER_MINNESOTA	JUDICIAL DITCH 18	5280	1.00
66	LOWER_MINNESOTA	JUDICIAL DITCH 18	5280	1.00
67	LOWER_MINNESOTA	JUDICIAL DITCH 18	2875	0.54
67	LOWER_MINNESOTA	CREEK TO BAKER'S LAKE	2405	0.46
68	LOWER_MINNESOTA	HIGH ISLAND CR	4223	0.80
68	LOWER_MINNESOTA	CREEK TO BAKER'S LAKE	1057	0.20
69	LOWER_MINNESOTA	HIGH ISLAND CR	3433	0.65
69	LOWER_MINNESOTA		1847	0.35

Surface Water Runoff
Immediate Receiving Waters

Mile	Major Watershed Name	Minor Watershed Name	Feet	Percent
70	LOWER_MINNESOTA		5280	1.00
71	LOWER_MINNESOTA		5280	1.00
72	LOWER_MINNESOTA	BAKER L	2452	0.46
72	SOUTH_FORK_CROW	BUFFALO CR	2012	0.38
72	LOWER_MINNESOTA		747	0.14
72	SOUTH_FORK_CROW	BUFFALO CR	69	0.01
73	SOUTH_FORK_CROW	BUFFALO CR	5280	1.00
74	SOUTH_FORK_CROW	BUFFALO CR	5280	1.00
75	SOUTH_FORK_CROW	BUFFALO CR	4662	0.88
75	SOUTH_FORK_CROW	BUFFALO CREEK	618	0.12
76	SOUTH_FORK_CROW	BUFFALO CREEK	5280	1.00
77	SOUTH_FORK_CROW	BUFFALO CREEK	4277	0.81
77	SOUTH_FORK_CROW	BUFFALO CREEK	1003	0.19
78	SOUTH_FORK_CROW	BUFFALO CREEK	5280	1.00
79	SOUTH_FORK_CROW	BUFFALO CREEK	5280	1.00
80	SOUTH_FORK_CROW	BUFFALO CREEK	4647	0.88
80	SOUTH_FORK_CROW	MCCUEN CR	633	0.12
81	SOUTH_FORK_CROW	MCCUEN CR	5280	1.00
82	SOUTH_FORK_CROW	MCCUEN CR	5280	1.00
83	SOUTH_FORK_CROW	MCCUEN CR	5280	1.00
84	SOUTH_FORK_CROW	S FORK CROW R	2887	0.55
84	SOUTH_FORK_CROW	MCCUEN CR	2394	0.45
85	SOUTH_FORK_CROW	S FORK CROW R	5280	1.00
86	SOUTH_FORK_CROW	S FORK CROW R	5280	1.00
87	SOUTH_FORK_CROW	S FORK CROW R	5280	1.00
88	SOUTH_FORK_CROW	BEAR CR	4912	0.93
88	SOUTH_FORK_CROW	S FORK CROW R	368	0.07
89	SOUTH_FORK_CROW	S FORK CROW R	5256	1.00

4415.0150 RIGHT-OF-WAY PROTECTION AND RESTORATION MEASURES.

Subpart 1. Protection.

The applicant must describe what measures will be taken to protect the right-of-way or mitigate the adverse impacts of right-of-way preparation, pipeline construction, and operation and maintenance on the human and natural environment.

HUC has developed a comprehensive Pollution Control and Spill Prevention (SPCC) procedure that deals with the protection, mitigation and restoration measures employed for a pipeline project. All of the Federal Energy Regulatory Commission measures for "Upland Erosion Control, Revegetation, and Maintenance Plan" and "Wetland and Waterbody Construction and Mitigation Procedures" relative to pipeline projects have been incorporated into the SPCC document. This document is available from HUC upon request. The SPCC document is included in the construction specifications attached to the prime contractors contract agreement. It is an integral part of the construction inspection process and the relevant portions, or the documents in their entirety will be issued to construction personnel and all contractors associated with the work.

In addition to those measures addressed by the SPCC plan, HUC will comply with the requirements of regulatory and permitting agencies such as the Army Corps of Engineers, Minnesota DNR and other agencies that may include conditions with permits. All measures and permit conditions are enforced during construction by third party environmental inspectors. They are required to participate in environmental training for the specific project. Third party environmental inspectors are selected based on prior pipeline inspection experience. HUC will require all construction personnel to attend environmental orientation and training in order to have access to the right of way.

Almost the entire route is located on private property. Landowners will have input into the measures taken to mitigate any impacts to the land during construction or operation of the pipeline.

Subpart 2. Restoration.

The applicant must describe what measures will be taken to restore the right-of-way and other areas adversely affected by construction of the pipeline.

Minnesota Rules Section 4415.0195 allows certain construction related activities such as tile repair, soil segregation, livestock and crop protection, repair to private roads and fence and gate repair or replacement to be negotiated with the landowner. HUC would generally not initiate negotiations for these tasks but would expect to perform them with contractor personnel. One restoration item that is traditionally negotiated with landowners is reseeding of non-cropland areas such as pastureland.

The Minnesota Environmental Quality Board will attach the following conditions to the routing permit as per the above mentioned MN 4415.0195 relative to right-of-way preparation, construction, clean-up, and restoration:

A. The Company shall comply with all applicable state rules and regulations.

B. The Company shall clear the right-of-way only to the extent necessary to assure suitable access for construction, safe operation, and maintenance of the pipeline.

C. Stream banks disturbed by pipeline construction must be stabilized using native plant species indigenous to the project area, or by other methods as required by applicable state and/or federal permits.

D. Precautions shall be taken to protect and segregate topsoil in cultivated lands unless otherwise negotiated with the affected Landowner.

E. Compaction of cultivated lands by the Company must be kept to a minimum and confined to as small an area as practicable.

F. Precautions to protect livestock and crops must be taken by the Company unless otherwise negotiated with the affected Landowner.

G. All appropriate precautions to protect against pollution of the environment must be taken by the Company.

H. All waste and scrap that is the product of the pipeline construction process must be removed or properly disposed of before construction ends.

I. Clean up of personal litter, bottles, and paper deposited by right-of-way preparation and construction crews must be done on a daily basis.

J. The Company shall repair or replace all drainage tiles broken or damaged during right-of-way preparation, construction and maintenance activities, unless otherwise negotiated with the affected Landowner.

K. The Company shall repair all private roads and lands damaged when moving equipment or when obtaining access to the right-of-way, unless otherwise negotiated with the affected Landowner.

L. The Company shall repair and replace all fences and gates removed or damaged as a result of right-of-way preparation, construction, and maintenance activities, unless otherwise negotiated with the affected Landowner.

M. Shelterbelts and trees must be protected by the Company to the extent possible in a manner compatible with the safe operation, maintenance and inspection of the pipeline.

N. The Company shall, to the extent possible, restore the area affected by the pipeline to the natural conditions that existed immediately before construction of the pipeline. Restoration must be compatible with the safe operation, maintenance, and inspection of the pipeline.

HUC agrees to comply with and implement any applicable measures outlined in these conditions.

4415.0160 OPERATION AND MAINTENANCE.

Pipeline operations and maintenance are assumed to be in compliance with all applicable state and federal rules or regulations, unless determined otherwise by the state or federal agency having jurisdiction over the enforcement of such rules or regulations. For public information purposes, the applicant must provide a general description of the anticipated operation and maintenance practices planned for the proposed pipeline.

The pipeline is jurisdictional to the Minnesota Office of Pipeline Safety (MNOPS). All facilities proposed for the HUC pipeline project would be designed, operated and maintained in accordance with DOT Minimum Federal Safety Standards in Title 49 of the CFR, Part 192 (49 CFR 192). These regulations are meant to ensure adequate protection for the public from failures of natural gas pipeline and related facilities. Part 192 defines and specifies the minimum standards for operating and maintaining pipeline facilities including the establishment of an Emergency Plan which provides written procedures to minimize hazards from a gas pipeline emergency. Key elements of the plan include procedures for:

- Receiving, identifying, and classifying emergency events – gas leakage, fires, explosions and natural disasters;
- Establishing and maintaining communications with local fire, police and public officials, and coordinating emergency responses;
- Making personnel, equipment, tools and materials available at the scene of an emergency;
- Protecting people first and then property, and making them safe from actual or potential hazards, and
- Emergency shutdown of the system and safely restoring service.

The safety standards specified in Part 192 require each pipeline operator to:

- Develop an emergency plan, working with local fire departments and other agencies to identify

personnel to be contacted, equipment to be mobilized, and procedures to be followed to respond to a hazardous condition caused by the pipeline or associated facilities;

- Establish and maintain a liaison with the appropriate fire, police and public officials in order to coordinate mutual assistance when responding to emergencies; and
- Establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a natural gas pipeline emergency and report it to appropriate public officials.

HUC currently operates natural gas pipeline facilities that are subject to the requirements of 49 CFR 192 and the MNOPS. Before placing the pipeline in service, it would prepare a revised procedural manual for operation, maintenance and emergencies to include the additional pipeline facilities of the proposed new pipeline. HUC would operate its pipeline facilities in compliance with applicable pipeline safety regulations.

HUC would inspect and maintain its pipeline facilities in compliance with MNOPS regulations. They are currently members of the Gopher State Excavators One-Call system that is vital in helping to prevent damage to underground pipelines by excavators and others performing underground construction. Semi-annual inspections of the pipeline right-of-way would be conducted for gas leak detection and cathodic protection surveys would be conducted annually.

4415.0165 LIST OF GOVERNMENT AGENCIES AND PERMITS.

Each application must contain a list of all the known federal, state, and local agencies or authorities and titles of the permits they issue that are required for the proposed pipeline and associated facilities.

The schedule shown on the following page lists all of the known government agencies or authorities and the titles of permits they issue required for the proposed pipeline project.

LIST OF GOVERNMENT AUTHORITIES

Unit of government	Title of Permit	Application Date	Status
Minnesota Public Utilities Commission	Certificate of Need	March 4, 2002	
Minnesota Environmental Quality Board	Partial Exemption of Routing Permit	March 2002	Application Submitted
US Army Corps of Engineers	Navigable Water Crossing Permits		To be submitted
	404 Wetlands		To be submitted
United States Fish and Wildlife Service	Federal Endangered Resources Consultation	July 13, 2001	
Minnesota Department of Natural Resources	License to Cross Protected Waters		To be submitted
	State Wildlife Related	July 13, 2001	
	Easement Across State Land		To be submitted
	Water Appropriation		To be submitted
	State Endangered Resources Consultation	June 15, 2001	
Minnesota Pollution Control Agency	NPDES Discharge Permit for hydrostatic testing water		To be submitted
	NPDES Discharge Permit for Constructing dewatering		To be submitted
	Stormwater Discharge for Construction Areas		To be submitted
	401 Water Quality Certification		To be submitted
Minnesota Department of Transportation	Utility Permits		To be submitted

LIST OF GOVERNMENT AUTHORITIES

Unit of government	Title of Permit	Application Date	Status
Minnesota Historical Society	Project Review – Cultural Resources	June 18, 2001	
Minnesota Wetland Conservation Act	Wetland Conservation Act Certificate of Exemption - for Martin, Watonwan, Brown, Sibley, Nicollet and McLeod counties		To be submitted
County Permits (Martin, Watonwan, Brown, Sibley, Nicollet and McLeod)	Road and Ditch Crossing Permits		To be submitted
County Shoreland Ordinances	Fill, Grade Permits		To be submitted
High Island Watershed District	Watershed District Permit		To be submitted
Buffalo Creek Watershed District	Watershed District Permit		To be submitted

The following governmental agencies will be provided notice and/or have an opportunity to take part in proceedings before the Minnesota Environmental Quality Board:

Governor's Representative
Department of Agriculture
Department of Health
Department of Natural Resources
Department of Public Service
Department of Transportation
United States Fish and Wildlife Service
Board of Water and Soil Resources
Minnesota Planning Office
Minnesota State Archaeologist
Office of Waste Management
Pollution Control Agency
Citizen Members
Minnesota Historical Society
Regional Development Commissions
Soil and Water Conservation Districts
Watershed Districts
Auditor of Each County
Clerk of Each Township and Incorporated Town

REFERENCES:

Bettis, E.A., III, Quade, D.J., and Kemmis, T.J., 1996, Hogs, bogs, and logs: Quaternary deposits and environmental geology of the Des Moines Lobe, Geological Survey Bureau Guidebook Series No. 18, 170 p.

Digital Soil Survey
MCLEOD COUNTY:
Originator - Unknown
Digital data set representing the information on the printed Natural Resources Conservation Service (NRCS) Soil Survey for McLeod County. Data is stored in public land survey township files.

Fenton, M.M., Moran, S.R., Teller, J.T., and Clayton, L., 1983, Quaternary stratigraphy and history in the southern part of the Lake Agassiz basin; *in* Glacial Lake Agassiz, Teller, J.T. and Clayton, L. eds., The Geological Association of Canada, p. 49-74.

Geologic Map of Minnesota: Depth to Bedrock, from MGS Map S-14, 1982
Land Management Information Center, Minnesota Planning and Minnesota Geological Survey
This dataset describes the depth to bedrock (based on 100-foot contour intervals) and the areas of significant bedrock outcrops in Minnesota, as delineated by the Minnesota Geological Survey. It is an automated version of the Minnesota Geological Survey State Map Series Map S-14 (Geologic Map of Minnesota: Depth to Bedrock), 1982, by B.M. Olsen and J.H. Mossler. (1:1,000,000).
The file is a modification of the published map. The file was modified by the Minnesota Pollution Control Agency to create closed polygons where none existed on the base map. This occurred primarily in the northwestern portion of the state, where few data points existed to draw contour lines, but where the depth to bedrock is generally high. This was done in order to enable the creation of a polygon digital coverage.

Geologic Map of Minnesota: Quaternary Geology, from MGS (Map S-1), 1982
Land Management Information Center, Minnesota Planning, and Minnesota Geological Survey
This layer describes the general distribution of surficial sediments in Minnesota, as delineated and classified by the Minnesota Geological Survey. It is a digital version of the Minnesota Geological Survey State Map Series Map S-1 (Geologic Map of Minnesota: Quaternary Geology), 1982, by H.C. Hobbs and J.E. Goebel. (1:500,000).
The digital file was created by scanning the 1:500,000-scale paper map and then converting the scanned image into an Arc/INFO polygon coverage. The Arc coverage was also converted to an EPPL 40-acre grid cell file, and then later updated for incorporation into the EPPL MGC100 data set.

Hudak, C.M. and Hajic, E.R., 1999, Landscape suitability models for geologically buried pre-contact cultural resources; *in* A predictive model of precontact archaeological site

Hunting, K., 2001, Personal communication on July 27, between Ken Hunting (Natural Gas Consulting) and Greg Tennant (District Conservationist – USDA) Sleepy Eye, MN.

Hunting, K., 2001, Personal communication on July 27, between Ken Hunting (Natural Gas Consulting) and Cheryl J. Kelly-Dobie (Senior Realty Specialist - Minnesota DNR, Division of Land and Minerals, District 4).

Hunting, K., 2001, Personal communication on July 30, between Ken Hunting (Natural Gas Consulting) and Tina Rosenstein (Director of Envirnomental Services – Nicollet County, MN).

Hydrogeologic Map of Minnesota: Bedrock Hydrogeology, from MGS (Map S-2), 1978
Land Management Information Center, Minnesota Planning, and Minnesota Geological Survey
This layer, (BDRKHYDR), describes the bedrock hydrogeologic conditions of Minnesota as delineated and classified by the Minnesota Geological Survey. It is a digital version of the Minnesota Geological Survey State Map Series Map S-2 (Hydrogeologic Map of Minnesota: Bedrock Hydrogeology), 1978, by Roman Kanivetsky. (1:500,000). Map data was originally grid-cell-coded by LMIC into a statewide 40-acre parcel representation in EPPL; the EPPL file was later converted to Arc/INFO using a state transformation process.

Hydrogeologic Map of Minnesota: Quaternary Hydrogeology, from MGS (Map S-3), 1979 (Digital Version)
Land Management Information Center, Minnesota Planning, and Minnesota Geological Survey
These layers describe the geologic classification of the hydrogeologic, or water-bearing, units for the Quaternary (surficial, unconsolidated) deposits in Minnesota as delineated and classified by the Minnesota Geological Survey. They represent an automated version of the Minnesota Geological Survey State Map Series Map S-3 (Hydrogeologic Map of Minnesota: Quaternary Hydrogeology), 1979, by Roman Kanivetsky (1:500,000). The Quaternary Hydrogeology file was created by digitizing the 1:500,000-scale paper map. The 'Quaternary Hydrogeology - Materials' and 'Quaternary Hydrogeology - Yield' layers were then created based on attributes assigned to the file. The Arc coverages were also converted into EPPL 40-acre grid cell files.

MAP UNIT INTERPRETATION DATABASE (MUIR) FROM NATURAL RESOURCE CONSERVATION SERVICE:
The fields for Component Name, Shallowest and Deepest Depth to Water Table with the Water Table Kind and Beginning and End month were obtained from this MUIR database.
The MUIR database is soil survey attributes based on the county soil survey maps. Descriptions of these fields can be found in the county soil survey map books.

Web Location of MUIR database is at
http://www.statlab.iastate.edu/soils/muir/schema_nat.html.

McLean, P., 2001, Telephone communication on November 13, between Phil McLean (Natural Gas Consulting) and Huon Newburg (Southwest Regional Fisheries Manager – DNR, 507-359-6046)

McLean, P., 2001, Telephone communication on November 15, between Phil McLean (Natural Gas Consulting) and Calvin Schrupp (Ditch Inspector - High Island Watershed District, 507-237-5208)

McLean, P., 2001, Telephone communication on October 24, between Phil McLean (Natural Gas Consulting) and Ken Varland (Southwest Regional Wildlife Manager – DNR, 507-359-6030)

McLean, P., 2001, Telephone communication on October 25, between Phil McLean (Natural Gas Consulting) and Huon Newburg (Southwest Regional Fisheries Manager – DNR, 507-359-6046)

McLean, P., 2002, Telephone communication on February 14, between Phil McLean (Natural Gas Consulting) and Bob Hobart (Property Specialist – Division of Lands and Minerals - DNR, 507-359-6071)

Minnesota Department of Health 2001, Community Public Water Supply Source GIS file, [Accessed 2001].

Minnesota Department of Transportation (MN DOT) 1999. General Highway Map of Martin County, MN.

Minnesota Department of Transportation (MN DOT) 1999. General Highway Map of Watonwan County, MN.

Minnesota Department of Transportation (MN DOT) 1999. General Highway Map of Brown County, MN.

Minnesota Department of Transportation (MN DOT) 1999. General Highway Map of Nicollet County, MN.

Minnesota Department of Transportation (MN DOT) 1999. General Highway Map of Sibley County, MN.

Minnesota Department of Transportation (MN DOT) 1999. General Highway Map of McLeod County, MN.

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Soil Survey Geographic Data Base (SSURGO)
MARTIN, NICOLLET, SIBLEY and WATOWAN COUNTIES:
U.S. Department of Agriculture, Natural Resources Conservation Service
These data sets are digital soil surveys and generally are the most detailed level of soil geographic data developed by the National Cooperative Soil Survey. The information was prepared by digitizing maps, by compiling information onto a planimetric correct base and digitizing, or by revising digitized maps using remotely sensed and other information.
This data set consists of georeferenced digital map data and computerized attribute data. The map data are in both a 7.5-minute quadrangle format and a county format and include a detailed, field verified inventory of soils and nonsoil areas that normally occur in a repeatable pattern on the landscape and that can be cartographically shown at the scale mapped. A special soil features layer (point and line features) is optional. This layer displays the location of features too small to delineate at the mapping scale, but they are large enough and contrasting enough to significantly influence use and management. The soil map units are linked to attributes in the Map Unit Interpretations Record relational database, which gives the proportionate extent of the component soils and their properties.
Note: This metadata record was created by the Minnesota Land Management Information Center to serve as a generic record for all SSURGO data sets within Minnesota. See the individual county metadata records created by NRCS for county-specific information: http://www.ftw.nrcs.usda.gov/ssur_data.html

Soils Derived from Soil Survey Information System (SSIS)
BROWN COUNTY:
Department of Soil, Water, and Climate, University of Minnesota
The original data was created from Natural Resource Conservation Service (NRCS, formerly SCS) county soil survey maps using the University of Minnesota's Soil Survey Information System (SSIS). SSIS is a non-GIS computer program originally created in the mid-to-late 1970s, that displays soil information on a section-by-section basis, along

on. Many of the SSIS files were then converted to EPPL7 raster GIS format with 5 meter by 5 meter grid cells, using 1:24,000-scale section corners to establish the geo-referencing. Finally, the sections were
combined into larger files; in most cases, each larger file covers one public land survey township. Most of the EPPL7 files have been converted
to ARC/INFO coverages, either by the University of Minnesota or by the Land Management Information Center. Note: the GIS data sets do not include soil unit attributes found in the tables in the printed soil surveys.

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